RAILROAD GAZETTE

FRIDAY, DECEMBER 12, 1902.

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## Annual Meeting of the American Society of Mechanical Engineers.

The first session of the 46th meeting of the American Society of Mechanical Engineers was held at the Society rooms, 12 West 31st street, New York, on Tuesday evening, Dec. 2. The meeting was called to order by Mr. A. M. Waitt, Vice-President, who presided throughout the session owing to the illness of Mr. Edwin H. Reynolds, President. Up to 10 p.m., Dec. 3, 420 members and guests had registered. By the end of the session this number had been increased to 663, making it one of the largest meetings ever held.

The business session was held Wednesday morning, Dec. 3, at the Sturtevant House, and the report of the Council was read. Among other things they reported the appointment of the following committee to co-operate with the other societies for the award of the John Fritz medal: Prof. G. Lanza, Boston; Prof. J. E. Sweet, Syracuse, N. Y.; Mr. S. T. Wellman, Cleveland, Ohio, and Capt. R. W. Hunt, Chicago, Ill. During the year 93 new members had been admitted.

The report of the committee on revision of the Constitution and By-Laws caused considerable discussion. The general sentiment seemed to be that juniors should cease to become members after the age of 30 unless new application is made and accepted for advanced standing. A resolution was adopted to that effect.

The following officers were elected for the ensuing year: President, James M. Dodge, Philadelphia; vice-presidents, F. H. Daniels, Worcester, Mass., James Christie, Philadelphia, and John R. Freeman, Providence, R. I.; managers, R. C. McKinney, New York, S. S. Webber, Trenton, N. J., and Newell Sanders, Chattanooga, Tenn.

The final report of the committee appointed to standardize a system of testing steam engines was given. A paragraph on the entropy-temperature diagram has been added and the committee further recommends that the Rankine cycle be adopted as the standard for comparing the ideal efficiencies of different engines. A number of written discussions of the report were presented.

### METRIC SYSTEM.

A paper by Mr. F. A. Halsey on the "Metric System" created much discussion. He attacked vigorously the bill now pending before Congress, legalizing the metric system of weights and measures. Among other things he attempted to show by statistics that even in those countries where the metric system had long been tried, there was still a hopeless confusion of units and that the adoption of the metric system in this country would therefore add to the confusion. Furthermore, he said, much of the testimony offered at Washington has no significance whatever and is incompetent. The fact that many prominent engineers had favored the bill seemed to give him much concern, and as stated "the array of names was enough to make one mad," a fact not doubted by any who were present at the meeting.

One of the first to pour oil upon the troubled waters was Mr. S. W. Stratton, of the Bureau of Standards. He was strongly in favor of the metric system and took up in detail many of the points in Mr. Halsey's paper. He thought that a universal standard must come sooner or later and that now was as good a time as any. Personal observations in Germany convinced him that the system was working satisfactorily.

Mr. J. H. Southard, Chairman of the House Committee on Weights and Measures, was invited to speak. He started out by telling a few jokes but ended up decidedly on the defensive owing to questions by the members. The substance of his argument was to the effect that the purpose of the bill was misunderstood and that its adoption would be only an experiment upon the government, in other words, to quote him, "try it on the dog."

The discussions which followed will, no doubt, fill many pages of the proceedings. Some thought a system of tens unnatural, which argument was successfully refuted by showing that inhabitants of the planet Earth had five fingers on each hand, or ten in all, while those on the planet Mars, having perhaps attained a higher civilization, had six fingers on each hand and used the duodecimal system. Another member, by a course of reasoning, tried to prove that the inch had God-given properties and that its abandonment would be sacrilegious and to cap the climax one insisted that he "was enough of a Yankee" to oppose a French system.

The entire question hung fire throughout the session and a committee was finally appointed to report to the council, who would in turn order a letter ballot before the next meeting.

Abstracts from some of the papers and discussions presented at the meeting follow.

ENTROPY ANALYSIS OF THE OTTO CYCLE.—SIDNEY A. REEVE.

The object of the paper was to emphasize the advantages of submitting all heat-engine records to the entropy analysis. Typical diagrams from engines using the Otto cycle are given and it is shown that in most cases the end of the expansion curve approaches an isothermal, the heat being abstracted from the cylinder walls. A method of constructing the entropy-temperature diagram for gas engines concludes the paper.

FLY-WHEEL CAPACITY FOR ENGINE-DRIVEN ALTERNATORS.—WALTER I. SLICHTER.

A synchronous motor or rotary converter having a constant load tends to run at constant speed and has more or less fly-wheel effect. If now this is connected to an alternator driven by an engine which has an irregular angular velocity giving an angular displacement from + 2.5 to — 2.5 degrees, there will be a continual give and take of current between the two and cause "hunting." The author has deduced formulæ for calculating the effective weight of fly-wheels for alternators and has applied his analysis to a number of engines at present in service.

HEAT RESISTANCE, THE RECIPROCAL OF HEAT CONDUCTIVITY.—WILLIAM KENT.

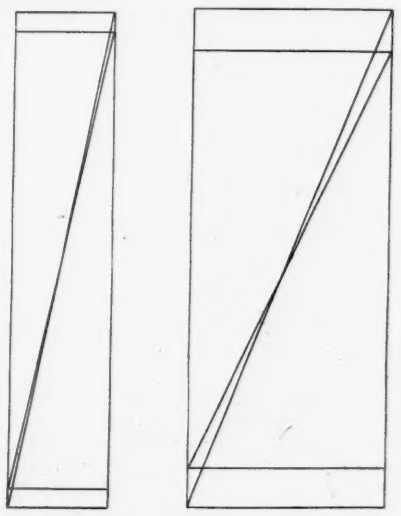
The writer proposes the following standard for expressing the heat resistance of various substances: The coefficient of heat resistance of a substance is equal to unity divided by the number of B. T. U. transmitted in one hour by a slab 1 sq. ft. in area, and 1 in. thick per degree Fahr. of difference of temperature between the two faces of said slab, both surfaces being exposed to still air.

A FORTY-FOUR FOOT PIT LATHE.—JOHN M. BARNEY.

The author describes a pit lathe having a face plate 30 ft. in diameter and 15 in. thick. The feature of interest in the machine is the method of drive, which is a paper friction roller, 18 in. in diameter, bearing against the rim of the face plate. Power is supplied by a 75 h.p. motor. The machine weighs about 480,000 lbs.

FINER SCREW THREADS.—CHARLES T. PORTER.

The writer of this paper believes that the pitches of our machine screw threads are far too coarse, and ought to be changed. They reduce the area of the bolt unnecessarily. The Sellers thread made a considerable gain in this respect, but in the larger bolts the reduction of area is still two or three times as much as needed. Again the inclination of the thread permits the nut to be jarred loose easily. For these two reasons, threads of much finer pitch seem to be called far. Finer threads will also be stronger to resist stripping, the circle on which the shear must take place being larger. This, however, is of no practical consequence, as the strength of threads to resist stripping in nuts of standard height is now more than twice the strength of the bolt.



The gain in strength of the bolt by the use of finer threads is shown in detail in a table, and the reduction of the inclination is illustrated in the accompanying diagrams. Fractions and odd numbers are avoided and the coarsest thread is six to the inch. In this system the angles will be rounded and filleted to the radius of .0045 in.

In the bolts most commonly used the increase of strength averages about 20 per cent., and that in all the bolts above 2½ in. the strength of each bolt, threaded on the system here proposed, will equal or exceed the strength of the next larger bolt, threaded on the existing system.

The reduction of inclination effected by the proposed system is best shown by the graphical method, using a 1 in. bolt for illustration. If a right-angled triangle be drawn, the base of which is equal to the circumference of the top or of the bottom of the thread, and the height equals the pitch, the hypothenuse will represent the inclination of the thread and its length in one revolution.

But these angles are too small for distinct illustration. In the accompanying diagrams the horizontal scale is full size and the vertical scale is 10 times full size. It will be seen that while the reduction of the inclination at the top of the thread in this bolt is 50 per cent., its reduction at the bottom of the thread is considerably more than 50 per cent.

THE USE OF A SURVEYING INSTRUMENT IN MACHINE SHOP PRACTICE.—C. C. TYLER.

Many machine shops now have floor surface plates upon which large work is laid out and various machining operations are performed by the use of portable machine tools secured to the plate.

Let us assume that we have a surface floor plate, suitable portable vertical slotters or planers, and portable horizontal drilling and milling machines, and that we are to construct a cast-iron ring of over 20 ft. outside diameter, properly proportioned. This ring is to be made of six similar sections suitably cored and ribbed, and the only operations to be described are the accurate planing of the joints, cutting the keyways, and drilling the holes for the clamping bolts.

Mount one section upon planed cast-iron blocks about 2 ft. thick and fasten securely to the floor plate, being careful to equalize any warped surfaces found in the casting. The center column is to be moved about upon the floor plate until its exact position in relation to the section has been determined by the use of the centering gage, and the column is then to be securely fastened to the floor plate, where it should remain until all the operations upon the section have been completed.

Mount a dividing instrument upon the center column, and with the telescope determine the correct position for the zero division of the divided circle, to insure equalizing the cut at each joint surface, and clamp the circle in this position. The next move is to secure a straight-edge or parallel to the floor plate in such a position that its front edge is in exact alignment with what is to be one finished joint surface. The location of the straight-edge is determined by the dividing instrument and by the use of a special target which rests upon the top of the straight-edge and has a zero line exactly in alignment with a shoulder which touches the front of the straight-edge. Another straight-edge is then to be secured to the floor plate under the other joint of the section, and its front edge must be set at exactly 60 deg. from the first straight-edge; its position being determined by the dividing instrument and the special target used in the previous case. The accuracy of the location of both straight-edges being demonstrated by proof surveys, we are ready for planing the joint surfaces.

For the joint planing operation let us use a portable vertical slotter or planer having the front edge of its base exactly parallel with the horizontal travel of the tool slide. Secure the portable slotter upon the floor plate with the front edge of its base exactly parallel to the front edge of the straight-edge; the accuracy of the setting being easily determined by a pin gage, and the fine adjustment being obtained by screw jacks bearing against the base and stop lugs inserted in the floor plate. While the roughing cuts are being made upon one joint surface, set a second portable slotter by the other straight-edge in the same manner and proceed with the roughing cuts at this end. In order that the workman while roughing may not cut beyond what should be the finished joint surface, it is advisable to scratch a finish line on the rim section at each joint, but the setting of the tool for its finishing cut is more easily and accurately made by the use of the telescope of the dividing instrument than by any other plan yet tried.

Before setting the tool for the final finishing cut it may be thought advisable to prove the surface of the last cut—a much simpler matter than at first appears. Let us suppose the last cut has left two-hundredths inch stock to be removed and that we have a target with a center line adjustable in a line parallel with one edge. By resting the edge of the target against the surface and adjusting its center line until it exactly cuts the center of the cross lines of the telescope when set at the correct angle, we can survey the joint surface and prove that it is or is not parallel with what is to be the finished joint surface. If the surface be found correct, the

finishing cut can be made at once; if there be an error, proper adjustment of the portable slotter must be made and the joint surface again surveyed after taking a light cut. The accuracy of the finished joint surface can easily be determined by the dividing instrument with suitable targets.

By the aid of the dividing and levelling instrument it is easy to test the accuracy of portable machine tools. In the case of a portable vertical slotter the vertical travel of the tool slide can be determined by setting the instrument so that the cross lines of the telescope exactly cut a line drawn upon the tool block when at its lowest position. Elevate the tool slide to its highest point, tip the instrument, and note the position of the line on the tool block in relation to the cross line of the telescope. If the tool travel is in a line perpendicular to the base, and the instrument has been properly levelled, there will be no variation in the reading. If the tool travel is not perpendicular, the instrument indicates the error, and correction can be made in the portable tool itself or shims can be used under the base to correct the error. To test the parallelism of the transverse travel of the tool slide with the front edge of the base of the machine, set the front edge of the base parallel with a straight-edge secured to the floor plate in a surveyed position—one edge of the straight-edge being approximately perpendicular to the tool slide. Adjust the tool slide until it is exactly perpendicular to the straight-edge by the scratched line as determined by the telescope. A transverse movement of the tool slide to its near and far position will indicate any error; if one be found, it is best to correct the machine by planing or scraping, as may be necessary.

To test the spindle travel of a portable horizontal drilling machine, set the instrument to cut the line of a target attached to the end of the spindle, and survey the spindle in its different horizontal positions. The vertical travel of the spindle slide can be determined by locking the spindle in one position and moving the slide up and down, the same as for testing the slotter. Other portable machines can be tested by similar means, and the result of the tests can be depended upon if the instrument is accurately made and the errors in the sub-divisions of the circle are known.

The method described has been practically applied to some of the mechanical operations incident to the manufacture of the eight 5,000 kilowatt, alternating current, engine type, 3-phase generators built for the Manhattan Railway Company by the Westinghouse Electric & Manufacturing Company. The paper describes the construction in detail.

GIFT PROPOSITIONS FOR PAYING WORKMEN.—FRANK RICHARDS.

How to change the worker's attitude toward his work by means of a change in the system of apportioning the recompense for it would seem to be the foremost problem of the opening years of the new century. How shall the worker, whatever his grade of skill or efficiency, who has hitherto worked only for a fixed daily wage, be so paid hereafter that he shall not only get all that he earns, but that he shall be willing and even desirous to do more, and thus to earn more, up to the limit of his ability? Daily wages, and the same wage for each, offer nothing at all to induce one man to do more than another. In spite of all efforts at equalization there is always an appreciable and often a very great difference in the quality or quantity of work done by different men; and if all are paid alike, then either some are not paid enough or some are paid too much, and pay by the day would never seem to be fair and just to all.

On the face of it, piece-work, or pay exactly proportioned to the amount of work done, is the only exact justice. On the promise of equitable payment for actual work, and in exact proportion to what is done, the worker claims too often to find that in the end it is a mere arrangement to squeeze from him more work for less wages.

This estimate of any system which has the name of piece-work is quite widely held by wage-earners. The essential justice of the piece-work system remains, and it might be well worth while to investigate the mistakes, and worse, which have misdirected its application. Instead of that, we have set to work to devise other schemes. The essential error in the *bonus* system and *premium* plan would seem to be in the ignoring of the strictly business relation of employer and employee.

[The author then gives concrete examples showing that the premium system is not equitable and that the employer is the one who gains most by it.—Editor.]

It is my view that for everything a workman can do there is a fair and equitable price, whatever the difficulty of determining that price, and that when the man does the work he should get the price. The piece which by extra exertion he does last brings as much profit to the proprietor as the first piece that is done, and it does not appear why the man should not have his pay the same for each. No one can assert that the premium plan gives him this. It does not appear to me that the premium plan, or any other *gift* proposition, offers or suggests a permanent or satisfactory solution of the problem of equitably adjusting the wage to the work, so that the opening century still has a job before it to devise some scheme more equitable and more deserving of permanent adoption.

In the discussion which followed Mr. H. L. Gantt, Consulting Engineer for the American Locomotive Co., submitted the following:

As the bonus system has been stigmatized as a gift proposition I shall confine my remarks to a description of the principles on which it is based and leave to the members the question of assigning it to its proper category.

Our object is to buy labor, and before attempting to do so we should try to find out as nearly as possible on what conditions those who have it for sale will put it at our disposal. A study of the subject from statistics reveal among others the following facts about the ordinary workman:

First.—For a fixed daily wage he will seldom do more than a fraction of the work he could do.

Second.—He usually follows very closely the methods he has been taught and is generally incapable of improving them to any great extent without assistance.

Third.—He is generally satisfied to jog along according to his old methods at his habitual speed for a specific day's pay, but will generally if a sufficient financial inducement be offered work to his full capacity and follow exactly instructions laid down.

Fourth.—This additional incentive has been found by experience to vary with the class of work and 20 per cent. to 80 per cent. of his day's pay.

If the work is light and the workman is not physically tired at the end of the day this extra compensation may be as low as 20 per cent. As an actual example of this class I may cite the running of a metal saw, in which the extra labor of the workman is making changes quickly and seeing that his machine is in condition to do its best work. If the work is such that the man becomes physically tired at the end of the day this extra incentive must be from 30 per cent. to 50 per cent. The running of ordinary machine tools such as lathes, planers, slotters and drill presses come under this head, as do most kinds of ordinary laboring work such as shoveling coal, sand, ore, etc., the handling of iron, the chipping of castings, etc.

If in addition to becoming physically tired the workman has to be subject to unpleasant conditions such as excessive heat, smoke or gases he requires a higher incentive to make him do all he can. From 60 per cent. to 80 per cent. will cover the usual conditions of blacksmithing, hammering and work around furnaces. As an example of an extreme case I may cite the hammering of tool steel, which falls within these limits.

The conclusion from the above statements is that no matter what the work is or how slowly it is being done by ordinary day work, we can by determining the proper amount for a full day's work and offering a suitable compensation for its accomplishment get a large number of men who will work at the increased speed in order to earn the reward which, for want of a better name, I have called a *bonus*.

When my paper on the *bonus system* was read last year a number of people said the principles had been applied only to certain classes of work and were not generally applicable. Soon after reading the paper referred to, the writer had the opportunity to go with the American Locomotive Company as Consulting Engineer.

I am able to say that in one plant the system has been successfully started, and not only are those men to whom it has been applied pleased, but their neighbors are pushing their machines harder than they ever did before with the hope evidently that they will be chosen next. This is exactly the reverse of the effect produced by the ordinary piece work. A certain amount of work based on the principles of the bonus system with instruction cards is being done in other plants of the American Locomotive Co.

Satisfactory results are gotten by keeping a daily balance of work done on a sheet that serves the same end for a whole order that the instruction card does for work on a single piece in one machine. By means of such a sheet, or series of sheets, we are enabled to compare graphically each day what has been done with what ought to have been done and use our energies in pushing forward that which is behind. Naturally such a sheet should be first introduced in the foundry and forge shop, for to ship a locomotive on a certain day each casting and forging must be made a definite length of time before that day to allow for machining and erecting. Such a sheet for the foundry shows the date each casting should be made and is made, and a proper series of sheets for the machine and erecting shops show the route each piece should take and the rate of progress it should make to arrive at the erecting shop in time to be incorporated without delay in the locomotive. This series of sheets may be likened to a train schedule, the instruction cards being directions or time-tables in detail for moving each portion of the work, the most important point being to avoid delays in making connections.

Having gotten the schedule in such shape that we can make connections promptly, the next effort of the manufacturer is to shorten the time of each piece over its route as much as possible. This can be done by shortening the time on each element of the route as represented by an instruction card, and by changing the route. Both of these operations in manufacturing are best done by experts, here again bearing out the analogy to a railroad, and new instruction cards and schedules made out. The compensation set for following these instruction cards must be made satisfactory to the workman or the piece will not move promptly. The foreman who sees that the pieces pass through his territory on schedule time should also get additional compensation for efficiency. Thus the whole system produces harmony, the foremen being instructors and helpers rather than drivers, for their interest and that of the men is the same.

The foreman of a foundry where this has been started told me that his job was much more pleasant than it had been. The order in which his work was wanted had been fixed and he was not bothered by people who thought they ought to be served first. The foreman of the machine shop in the same plant told me that his running around had been cut in half.

To sum up the subject then the bonus system consists simply in: First.—Having every problem, big or little, investigated by the best experts available. Second.—Teaching the results of the expert investigation to those not capable of making it. Third.—Rewarding such men as show themselves able and willing to carry out the methods adopted.

The direct results are: Increase in quantity of output, increase in economy of output, increase in efficiency of workmen. An indirect result of the keeping the exact records that such a system demands is the moral effect, for in the daily balancing of accounts everything comes to light, and he who prefers darkness finds the conditions unpleasant.

By the adoption of modern methods all the clerical work I have indicated can usually be done by the time and cost department in addition to their regular work without additional clerks, and sometimes with fewer.

ROTARY PUMPS.—JOHN T. WILKIN.

This paper describes the action of a rotary pump and sets forth its several advantages for certain classes of work. The writer has taken many indicator cards from engines operating rotary pumps, and finds the combined efficiency of the pump and engine to be from 80 to 84 per cent.

Two large pumping plants are now under way near Beaumont, Texas, for the Treadway Canal & Rice Co., one plant consisting of four 35,000 gallon pumps, operating under 35 ft. head, direct coupled to compound condensing Corliss engines; the other plant consisting of two 70,000 gallon pumps, operating under 10 ft. head, direct coupled to tandem compound condensing Corliss engines. These plants are to be operated with oil fuel, and we hope to be able to make accurate duty tests of them and place the records of these tests before the engineering world.

A NEW OIL TESTING MACHINE AND SOME OF ITS RESULTS.—ALBERT KINGSBURY.

One of the most frequent causes of contradictory results in friction tests is that the effects of viscosity may readily mask the effects of body, and another cause is found in the changes in the rubbing surfaces, which always take place with wear, and which must, therefore, accompany any test for body.

In these tests the load and the speed were kept constant, the viscosity of the oil being varied in each case by varying the temperature. For each of the three oils, the minimum coefficient of friction is reached at a temperature of about 180 deg. Fahr., with the given speed and pressure. As the temperature varies either way from this value, the coefficient of friction increases; on the one hand increasing with the viscosity of the oil, the metallic surfaces being completely separated by a measurably thick film; on the other hand increasing because the decreased viscosity permits the surfaces to approach so that some parts of the nominal bearing areas are subjected to very intense pressures, up to the limits of strength or plasticity of the metals. It is in these localities that the body of the lubricant determines to some extent the friction and the wear of the journal, the viscosity being also effective on some parts of the area.

The relations of the coefficient of friction to the other variables may be stated as follows:

| With increase of | Where the viscosity is effective, the coefficient of friction | Where the body is effective, the coefficient of friction |
|---|---|---|
| Pressure ..... | Decreases | Increases |
| Speed ..... | Increases | Decreases |
| Temperature ..... | Decreases | Increases |
| Viscosity ..... | Increases | Decreases |
| Body ..... | ..... | Decreases |

While the coefficient of friction is not always constant for any one oil, the one effecting the greater reduction of friction is readily distinguished, and, hence, is to be regarded as having the greater body. This appears to be the principal use which can be made of the numerical results, since the mean values of the coefficients of friction are not characteristic of the oils, but depend also upon the varying degree of roughness of the surfaces, the loads, the speeds, the temperatures, and the kinds of metals forming the journal and the bearing. Nevertheless, great or small differences in the values of the coefficients of friction must be taken as indicating correspondingly great or small differences in body.

In the topical discussion Mr. W. J. Wilcox presented the following in answer to the question *What has been your experience with oil burners?*

The Southern California Division of the Santa Fé Railroad burn, on all their locomotives, crude oil which has an asphaltum base and costs $1 per barrel. It is received in large storage tanks from pipe lines and tank wagons, from which tanks it is pumped into local tanks near the track, whence it runs by gravity to a stand pipe, and is delivered to the engine.

The engine tanks are built with round corners on top and no coal space in front, the oil tanks being built in the water tanks, and holding about seven tons of oil. They are supplied with steam coils for heating the oil to make it flow freely in cold weather, and are also

connected with the air reservoir with pipes, check valves, and gage and pop safety valve, where a pressure of 3 to 4 lbs. is sometimes used to get a free flow of oil. The oil is taken from the tanks by means of a hose connection between engine and tender, the oil valves on the tender being connected with the engine by an automatic device which closes them in case the engine and tender part. The oil after it leaves the tank flows to a hot box, as it is called, under the engine deck, where it is heated by steam. The flow of oil from this heater is regulated by a stopcock manipulated by a rod running up through the deck to a brace about level with the throttle lever. The upper end of the rod is provided with an arm or handle, which runs around an arc or quadrant having teeth milled into it to hold the dog on the handle, which is operated by the fireman to regulate the flow of oil to the burner.

The burner is about 12 in. long and 4 in. wide, and made of brass, having two passages cored in it, one for oil and one for steam, both of which enter at the back end. The front end has two openings, one for oil, 3 in. long and ½ in. wide, and one for steam 3½ in. long by 1/32 in. wide, the steam opening being below, so that the steam carries the oil with it when the burner is operated. A globe valve within easy reach of the fireman regulates the atomizer, so called because it atomizes the oil in the fire-box. The burner is placed under the mud ring at the back of the ash pan, which is partitioned with a false circular bottom riveted to the upper part of the sides, and dropping enough in the middle to take the burner. This partition, which is cast-iron, is provided with three holes about 8 x 12 in. and 8 in. apart. The air enters the pan through dampers at the front and back below the partition, and passes up into the fire-box, which has no grates. The pan and fire-box are lined with fire-brick as high as the flues on the sides, front and back, and the brick arch extends from the front wall about one-third the length of the fire-box; it has no opening in front or through it. The combustion takes place below the arch, and the flame passes around the arch and then to the flues. The fire door has a hole through its center covered with a slide, through which the fireman cleans the flues when they become clogged with soot, with sand handled from a big-mouthed funnel having a spout at its bottom. The spout is placed in the hole in the door, and the sand is drawn into the flues by the exhaust.

The front-end arrangement is provided with a medium-height nozzle just below the center of the boiler, over which is a conveyor petticoat pipe, netting and diaphragm plates being dispensed with. The same sized nozzle tips are used as with coal-burning engines. The best results are obtained when you can just see the least color of the smoke issuing from the stack. The fireman shuts off when the engineer does, or he has black smoke, and regulates his fire with the draft of the engine by the quantity of oil feed, the atomizer, and blower.

The engines average about 30 miles on freight and 55 miles on passenger service to one ton of oil, some having made more than 100 miles and some less than 25 miles in different service. The oil is measured in pounds, 8 lbs. to the gallon, and 42 gallons to the barrel, which would be about six barrels to the ton, so the cost of one ton of fuel oil would be $6.

Measurement is made in the tanks by means of steel gages, the amounts in the tank before and after taking, and the difference being charged to the engines first in inches, and, after calculating in the office, in pounds, each inch representing so many pounds.

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The Prussian government has made proposals to purchase six of the few remaining private railroads in the Kingdom, which are all in eastern and northern Germany. These are in a country almost exclusively agricultural; and the chief ports with which they connect are Dantzic and Königsberg, to which they carry a great deal of Russian grain. Some of them have yielded a fair profit, and others very little. The terms offered are regarded as advantageous, and the shares advanced on the exchange after the offers were announced. It is reasonable to suppose that the State with its great connecting system can work them to better advantage than a number of independent managements; for the aggregate length of the six railroads is but 560 miles. It will be a delicate business for the government to make joint rates with the Russian railroads, to make a market for Russian grain while Prussian land-owners are complaining that they can hardly keep out of the poor-house; but a State railroad administration has a great deal of such delicate business to do—and private railroads not a little.

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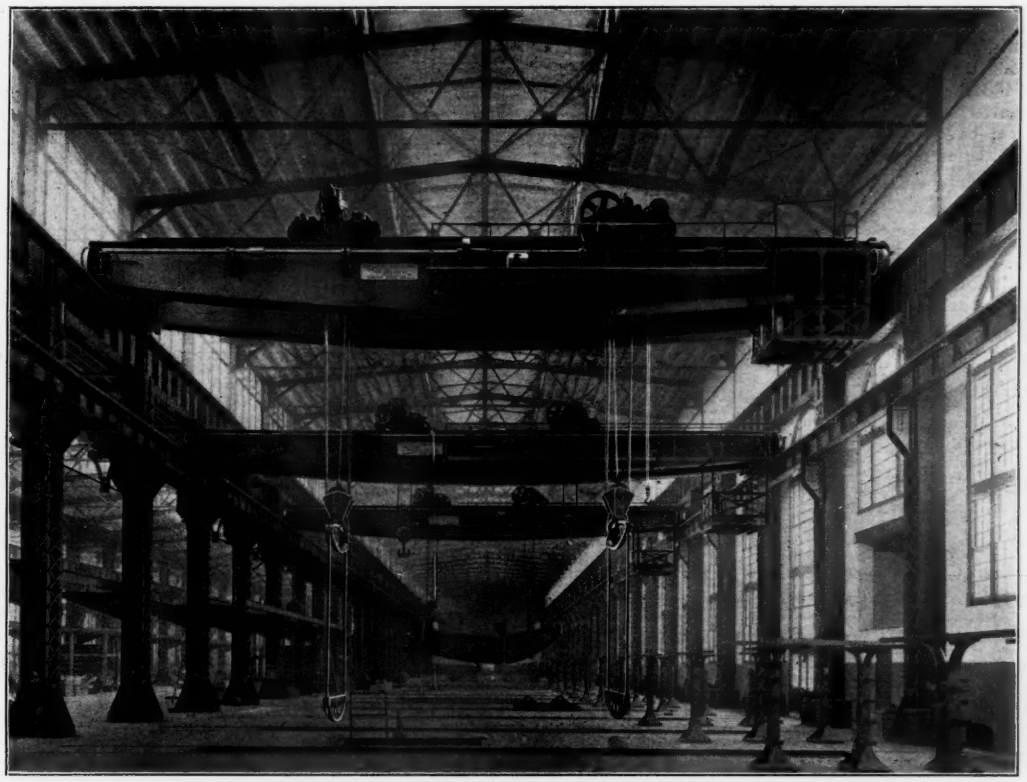
## New Locomotive Repair Shops of the Philadelphia & Reading.

[WITH AN INSET.]

Although the Philadelphia & Reading operates but 1,455 miles of track it has 950 locomotives and when present orders are filled, will have 1,000. The new shops at Reading have an ideal location, all points on the system being within a radius of 150 miles. These new shops, which will have, when completed, a capacity for 750 locomotives a year, will take care of the bulk of the equipment. The old shops at Reading will no doubt be abandoned and the small shops at junction points will only be used for light repairs.

The new shops have been built on a tract of land known as the "farm" about one mile north of the Reading station and alongside the tracks of the Philadelphia & Reading. The general features and details of the design are the result of several years study on the part of the Superintendent of Motive Power, Mr. S. F. Prince. Others who assisted in the development of the scheme were Mr. E. E. Brown, Electrical Engineer; Mr. E. L. Moser, Chief Draughtsman, and Mr. F. A. Tyson, General Foreman. The architects were Messrs. Wilson Brothers & Company, of Philadelphia. The entire plant is laid out on a colossal scale and is no doubt the largest of its kind in the country. For purposes of comparison the following table is given showing the sq. ft. of floor space in the principal buildings.



**West Bay of Locomotive Shop—Reading Shops.**
*(Niles Electric Traveling Cranes in Foreground.)*

| | Sq. ft. |
|---|---|
| Locomotive shop | 148,000 |
| Boiler shop | 48,000 |
| Forge and smith shops | 37,840 |
| Foundry | 52,000 |
| Power house | 19,600 |
| Carpenter shop (4 stories) | 48,000 |
| Storehouse (2 stories) | 14,000 |
| Stockhouse | 6,440 |
| Cleaning pit house | 2,200 |
| Office building (3 stories) | 12,384 |
| Total | 390,464 |

The shops have been planned so as to permit of indefinite extension in the future and by referring to the general layout it will be seen that any of the buildings may be extended without altering the general scheme. The cost of handling material, which is always an important factor in repair work, will no doubt be reduced to a minimum by the liberal use of overhead cranes and the careful arrangement and inter-connection of the several shops. In this respect it is a good example of what is considered best in present day practice.

A locomotive, after entering the locomotive shop from one of the two turn-tables, is picked up by a 120 ton overhead electric traveling crane and carried to an empty pit. It is then dismantled, and the boiler carried to the south end of the shop by a 35-ton crane. From here it is run across to the west bay, where another 35 ton crane picks it up and deposits it in the boiler shop for repairs. This applies only to the east side pits. From west side pits, boilers can be taken to the boiler shop direct without changing cranes. Other repairs are made in the machine shop, which occupies the center bay between the erecting pits.

Tank repairs are made in the south end of the boiler shop, which contains five storage tracks. The smith and forge shops are also under one roof. The supplies for the boiler, smith, forge, and machine shops are kept in the storehouse which connects the forge and boiler shops. The other buildings are independent structures.

*Locomotive Shop.*—This is a brick and steel building 740 ft. long and 200 ft. wide. It is divided into three bays, the center bay 60 ft. wide being used as a machine shop. Each side bay is 70 ft. wide and contains 35 erecting pits. Two 10 ton Niles electric traveling cranes traverse the central bay and each side bay is served by one 35 ton and one 120 ton crane of the same make. In the west bay the crane runway extends into the boiler shop and an extra 35 ton crane is provided for the boiler shop. The runways for the 120 ton cranes are on top of the line of steel columns, and the runways for the 35 ton and 10 ton cranes are supported on brackets fastened to the columns beneath the 120 ton cranes.

The clear height under the steel roof trusses in the side bays is 46 ft. 6 in., and in the center bay 33 ft. 5⅛ in., giving an offset of about 13 ft., which is utilized as additional window space for lighting the side bays. A monitor having a slag roof and swinging windows in the side extends the entire length of each side bay and a similar monitor with a glass roof covers the peak of the center bay or machine shop. The lighting of the shop is splendid, as will be seen by referring to the accompanying engraving giving a view of the west bay looking north.

The 120 ton Niles crane which is shown in the foreground is equipped with two standard 60 ton trolleys, and one of these trolleys has an auxiliary hoist of 6,000 lbs. capacity, for use with light loads where speed is essential. The span of this crane is 69 ft.; it is equipped with six General Electric motors and controllers. The trucks of this crane have four wheels each. The two 5-motor Niles cranes in the background of the photograph are of 35-tons capacity each, and one of them is shown holding a stake of a hydraulic riveting machine.

The fan houses for the heating system are small wings extending beyond the main building. Each fan is driven by an induction motor chain connected. An underground duct runs along each side of the building with openings into the shop near the floor level. As we have before pointed out* this design illustrates in a very good way the extent to which the heating system affects the plans for shop building, and why they should be considered and settled quite early so that valuable floor space in the more costly structure will not be used for this purpose.

The erecting pits are each 4 ft. wide and 2 ft. 6 in. deep with rounding bottoms made of cement concrete. Every two pits drain into a duct which leads to the outside of the building. The water from the roof is also conveyed to this duct through pipes leading inside the steel columns.

A power tunnel 17 in. below the floor line enters the shop from the power house and contains the steam, hot water and air pipes. The floor of the tunnel is built up of vitrified clay conduits in which are run the lead covered electric cables supplying the light and power to the shops. In each side bay at right angles to and connecting with this tunnel is another tunnel connecting the erecting pits.

The floor of the shop consists of a foundation of bituminous concrete on top of which is a layer of 3 in. x 8 in. hemlock with a surface of 1⅛ in. x 4 in. maple planks.

The total floor space in this shop is 148,000 sq. ft., as against the 131,750 sq. ft. in the locomotive shop of the Atchison, Topeka & Santa Fe at Topeka, Kan. This latter shop† is 850 ft. long and 155 ft. wide.

*Boiler Shop.*—A 17 in. dwarf wall 15 ft. high with a doorway 9 ft. x 12 ft. in the center, separates the boiler shop from the west erecting bay. The building is of brick and steel construction and is 400 ft. long and 120 ft. wide. The shop is divided into two parts—a main bay 70 ft. wide, and a lean-to 50 ft. wide. The main bay is served by a 35 ton crane, the runways of which are continuous with those in the west bay of the erecting shops (as previously mentioned). This gives a runway 1,140 ft. long. The clear height under the roof trusses in the main bay is 36 ft. 6 in. and in the lean-to 21 ft. 6 in. A monitor with slag roof and pivoted windows in the side covers the peak of the main bay. Five ventilators, each having 16 windows, are spaced at equal intervals along the roof of the lean-to.

The sub-division of the shop is as follows: Beginning at the north end, 220 ft. of the main bay is taken up

*Railroad Gazette*, June 20, 1902, p. 480.
†*Railroad Gazette*, Nov. 7, 1902, p. 851.

by the boiler erecting shop. The remainder of this bay is devoted to tank repairs and (as before mentioned) contains five erecting tracks each 180 ft. long. The middle track extends the length of the shop.

At the north end of the lean-to is the boiler machinery, which includes one new 15 ft. motor driven bending roll, a group of Hilles & Jones radial drills mounted beside a pit 9 ft. deep; a large Hilles & Jones combination motor driven punch and shear, together with the usual hydraulic punches and plate planers. South of the boiler machinery is a large 12 ft. x 12 ft. flanging furnace, an illustration of which is shown herewith, and an 8 ft. x 12 ft. hydraulic flanging press, the latter having been furnished by R. D. Wood & Co. A five ton electric traveling crane having an overhead clearance of 16 ft. traverses the lean-to for a distance of 160 ft. from the north end up to the riveting tower, which is immediately south of the above mentioned flanging press.

In the riveting tower is a 17 ft. hydraulic riveter served by a traveling crane. The accumulator is in a small lean-to adjoining the tower, and is supplied by a pump direct driven by an electric motor. The tower is 76 ft. high from floor to roof. The framing is steel and is covered with No. 22 corrugated galvanized iron. The roof is slate on 1⅛ in. hemlock sheathing. The rectangular section of the tower is 29 ft. 8½ in. x 20 ft. center to center of columns. South of the riveting tower are the sheet iron and the flue shops, in each of which are the usual smaller tools.

The floor of the boiler erecting department, flange shop and flue shop is clay, while the remainder of the shop has a wooden floor. Kinnear rolling steel doors are at the south end of the shop—one for each tank track.

*Smith and Forge Shops.*—These two shops are in the same building and thus follow out the general scheme of grouping all work of similar character. The building is 568 ft. long and 60 ft. wide—the southern half being the smith shop and the other half the forge shop, the latter having a furnace lean-to 188 ft. long and 20 ft. wide. The clear height under the trusses is 30 ft. and a 10 ton electric traveling crane, having a clearance of 23 ft., runs the entire length of the shop. A monitor having a slag roof and pivoted window sashes in the side covers the peak of the roof. The floor is earth and a railroad track runs through the shop.

The arrangement of the tools in the two shops is shown in the accompanying plan. On the east side of the forge shop and close to the lean-to are four steam hammers, two of which are new, one having a capacity of 6,000 lbs., and the other 2,500 lbs. They were furnished by the Chambersburg Engineering Co. The two other hammers, one of 4,000 lbs. and the other 2,500 lbs. capacity, were removed from the old shops. In the lean-to are six heating furnaces, over each of which is a fire-tube boiler 72 in. in diameter and 19 ft. long, for utilizing the waste heat. The rating of each boiler when worked at its normal capacity is about 140 h.p. These boilers furnish steam for the above mentioned hammers and also for one new 1,600 lb. limb hammer and one 1,000 lb. drop hammer in the forge shop, and for three smaller hammers in the smith shop. The boilers are also connected to the main exhaust line, and by reducing the pressure can be made to assist the heating system.

At the north end of the shop and adjoining the storehouse is a long heating furnace. South of this is an air bending machine furnace, on either side of which is an air machine. South of the air bending machines is a drop hammer furnace which serves the 1,000 lb. hammer before mentioned. A series of 10 forges completes the tool equipment of the forge shop. By referring to the plan it will be seen that jib cranes have been liberally used.

The smith shop equipment includes 52 down draft forges, 26 on each side and arranged in pairs. In the center of the shop are three steam hammers—one of 600 lbs. and two of 700 lbs. capacity. In addition to the forges there are three small heating furnaces built in the west wall and one case hardening furnace with independent stack in the east wall. The south end of the shop contains the small machinery such as screw cutting machine, chamfering machine, shears, trip hammer, bolt machine and bolt furnace, the latter having a grate 4 ft. 6 in. x 12 in. and a blast pipe 6 in. in diameter. Three blower houses, two on the west side and one on the east side, contain fans which furnish the necessary blast. Each blower house is 11 ft. long and 18 ft. deep.

*Storehouse.*—This building has a central location, being between the boiler and forge shops, to which it is directly connected, while a track leads straight into the machine shop. The building is 100 ft. long and 70 ft. wide and has two stories. The first floor is on a level with the floor of a standard box car so that supplies can be quickly and economically transferred from the cars. A 6 ft. x 9 ft. elevator connects the first and second floor. The ceiling of the first floor is pierced by two large wells for lighting and ventilation. In the roof and above these wells are skylights.

*Foundry.*—This building is about 90 ft. east of the forge and smith shops, and is of brick and steel construction, being 400 ft. long and 130 ft. wide. The heavy work is done in the main bay, which is 60 ft. wide. On each side of this bay is a lean-to 35 ft. wide. The height under the trusses in the main bay is 35 ft. and in the side bays 20 ft. The windows, which extend from the roof of each lean-to to the lower chord of the main trusses, furnish an abundance of light. The shop is further lighted by the windows in the side of the monitor which surmounts the main roof. Ten ventilators 18 in. in diameter are placed at equal intervals on the peak of the monitor and along the roof of each lean-to.

A 10-ton 3-motor electric traveling crane spans the main bay, with runways the entire length of the shop. Each lean-to has two one ton air cranes. The runways for these latter cranes are interrupted on the west side by the core ovens which extend to the roof truss and on the east side by the cupolas and blower room. Four five ton portable electric jib cranes furnished by A. Box & Co., Philadelphia, are used in the main bay. These cranes have a swing of 25 ft., and every column is provided with supports for these cranes. Another two ton jib crane with a 30 ft. swing is on the outside of the south end of the shop.

In the northwest corner are two small rooms, one for metal storage and the other for boring machines.

Next to these rooms is the brass furnace. In the northeast corner of the shop is another small room containing the sand blast apparatus. East of this room is the wash room, which has a drained cement floor. At the south end of the wash room are 12 shower baths for the use of the workmen.

The blower room for the two cupolas is 20 ft. deep and has a flat dust proof ceiling. Directly above this ceiling is the charging platform 18 ft. above the floor level. This leaves 7 ft. headway above the charging platform. Each cupola has a capacity of 15 tons an hour. An electric elevator having a platform 6 ft. x 6 ft. and a capacity of 3,000 lbs. connects the charging platform with a tunnel from the stock house near by.

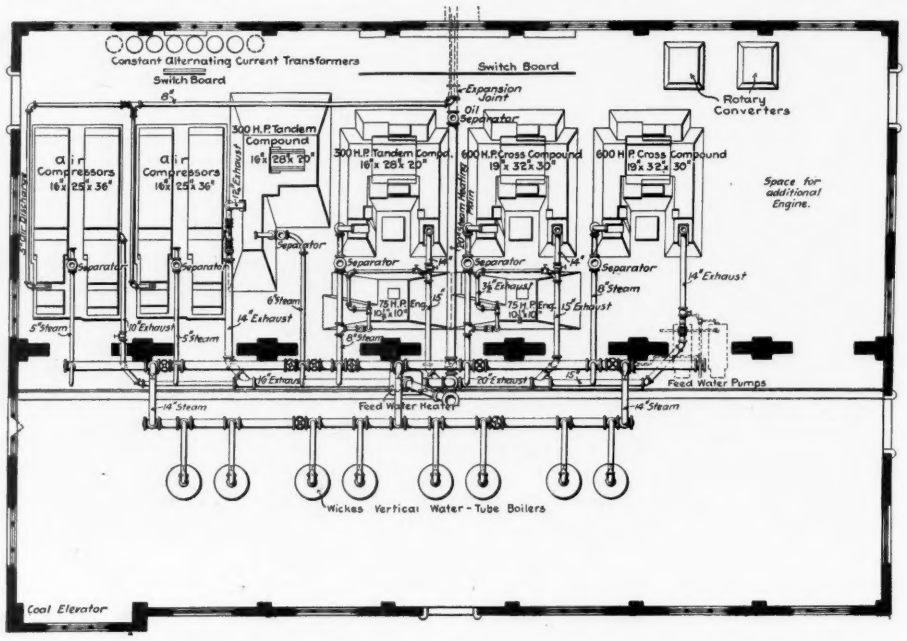
The foreman's office is on the west side of the shop in a little annex 20 ft. long and 14 ft. wide.

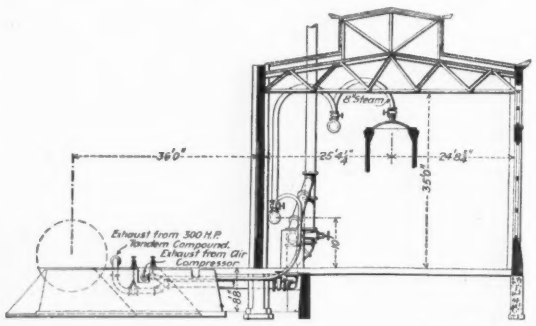
*Stock House.*—The design and arrangement of the stock house is another example of the careful attention which has been given the question of economical handling of materials. The building is 161 ft. long and 40 ft. wide, with a clear headway of 20 ft. beneath the roof trusses. A tunnel 7 ft. deep and 6 ft. wide connects the stock house with the elevator shaft of the foundry. The floor of the stock house is on a level with the bottom of the tunnel. A series of wooden bins are built along each side of the building. These bins vary from 10 ft. to 13 ft. in length, but have a uniform extreme height and width, the width being such that a clear way of 8 ft. is left along the center of the building. Over each set of bins is a standard gage track, and on which loaded cars may be run and unloaded into the bins below.

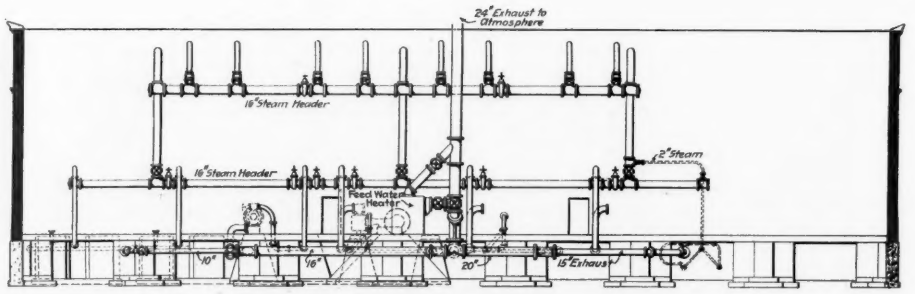
There are 14 bins on each side of the building and in these will be kept all the materials needed in the foundry. A narrow gage track at the low level runs between the line of bins and connects by means of a turn-table with the track in the tunnel. By this means a small truck can be run alongside any bin, loaded, pushed to the turn-table, run through the tunnel and onto the elevator platform. If the material is for the cupola, it is raised to the charging platform and dumped. If, however, it is sand to be used in the foundry, the elevator stops at the ground level and the car is run out onto a track which leads inside the foundry.

The bins are framed with 10 in. x 12 in. yellow pine timbers and are covered with 3 in. boards of the same material. The bottom timbers are anchored in the 24 in. stone foundation by means of 1 in. bolts. Kinnear rolling steel doors are at each end of the building.

*Carpenter and Pattern Shop.*—This building is between the foundry and the power house and is 200 ft. long and 60 ft. wide. There are four floors. The south end of the first floor is used for lumber storage, the north end contains the electrical and scale departments, while the paint shop is in the middle. The general carpenter and pattern shop is on the second floor and the third and fourth floors are used as pattern storerooms. The two elevators, one on the south side and the other on the west side, have 10 ft. x 12 ft. platforms.


Constant Alternating Current Transformers
Switch Board
Switch Board
Expansion Joint
Oil Separator
Rotary Converters
air Compressors 16" x 25" x 36"
air Compressors 16" x 25" x 36"
300 H.P. Tandem Compound 16" x 28" x 20"
300 H.P. Tandem Compd. 16" x 28" x 20"
600 H.P. Cross Compound 19" x 32" x 30"
600 H.P. Cross Compound 19" x 32" x 30"
Space for additional Engine.
Separator
75 H.P. Eng. 10" x 10"
Feed Water Heater
Feed Water Pumps
Wickes Vertical Water-Tube Boilers
Coal Elevator




**Power House Showing Arrangement of Machinery and Piping—Reading Shops.**

*Power House.*—The power house is 110 ft. east of the main locomotive shop, the east and west center line of the latter building coinciding with that of the former. The building is 175 ft. long and 112 ft. wide, and is divided longitudinally into two rooms. The east room, 50 ft. wide, contains the boilers and boiler machinery, and the west room, 62 ft. wide, contains the engines, dynamos, air compressors and other electrical machinery. A 10 ton hand crane is over the machinery.

The steam generating plant consists of eight Wickes vertical safety water-tube boilers set in four batteries and supplying steam at 150 lbs. pressure. Each boiler has a rated capacity of 250 h.p., 10 sq. ft. of heating surface being allowed for each horse-power. Roney mechanical stokers are used, each stoker having 63½ sq. ft. of grate surface. The stokers, with 1⅛ in. of draft, were guaranteed to develop the full rated horse-power and evaporate 10½ lbs. of water per pound of combustible when using No. 2 buckwheat coal. A test, conducted by Mr. E. E. Brown, Electrical Engineer for the Reading, on one battery gave an evaporative efficiency of 10.67 lbs. with a draft of ½ in. and the boilers developing 87 per cent. of their rated capacity.

An underground flue connects with a 10 ft. Alfonso Custodos stack 125 ft. high. Additional draft is furnished by a 10 ft. blower which delivers into a duct running in front of the ash pits. Without the use of the blower, a stack at least 225 ft. high would have been necessary. On the other hand, the cost of handling the

stokers is no doubt somewhat increased by the present draft arrangement.

The boilers are fed by two Jeanesville pumps water regulated by a Vigilant feed water regulator in combination with Reliance water columns with high and low water alarms. The water is heated by a 2,000 h.p. Cochrane open heater.

Coal is dumped from the cars into a hopper on the outside of the building, and raised by regular bucket elevator and scraper line into the coal bin above. Another scraper line under the ash pits removes the ashes to the ash house, where they are elevated into the bin, from whence they are dumped by gravity into cars. The ash and coal handling machinery is electrically operated.

The steam piping has been very carefully designed by the mechanical department, the arrangement being such that any section can be cut out for repairs without tieing up the entire plant. Each boiler connects by means of an 8 in. steam loop, with a 16 in. steam header along the top and back of the boilers. Three 14 in. looped pipes connect this header with another 16 in. header extending along the west wall of the boiler room 10 ft. above the floor level. From this latter header are taken off the steam lines, for the engines. Each steam line makes a loop and passes under the engine room floor, which is of arched concrete construction. All the piping was done by the Best Manufacturing Co. Pittsburgh.

The air compressor plant is at the south end of the machinery room and when completed will consist of two 16 in. x 25 in. x 36 in. two stage Ingersoll-Sergeant air compressors with Corliss compound steam cylinders. One of these is now in place. Each compressor has a capacity of 1,500 cu. ft. a minute to 125 lbs. pressure. The steam supply pipe to each compressor is 5 in. in diameter and a 5 in. air discharge pipe connects into an 8 in. air main which passes through the power tunnel to the locomotive shop.

The electrical equipment includes three 400 kilowatt and one 200 kilowatt, 480 volt, 2 phase, 60 cycle revolving field General Electric generators.

The three 400 kilowatt generators are each direct connected to a 600 horse-power 19 in. x 32 in. x 30 in. McIntosh & Seymour cross compound engine running at 150 revolutions per minute, and the 200 kilowatt generator is direct connected to a 300 horse-power 16 in. x 28 in. x 20 in. tandem compound Harrisburg engine running at 200 revolutions per minute. The engine speed of all four units is controlled at the switchboard by means of a small switch operating a series motor mounted on the engine governor, the same changing the cut-off of the engine by changing the tension of the governor springs through worm gearing. In this manner the engines can be synchronized or the load properly apportioned by one person at the switchboard in place of the usual throttling operation involving two men. These units all rest on slag concrete foundations.

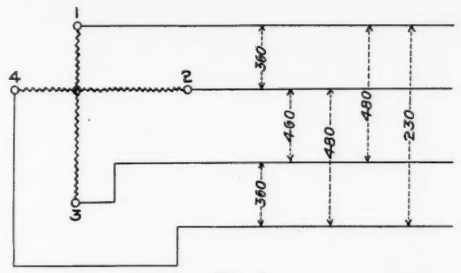



*Fig. 1.*

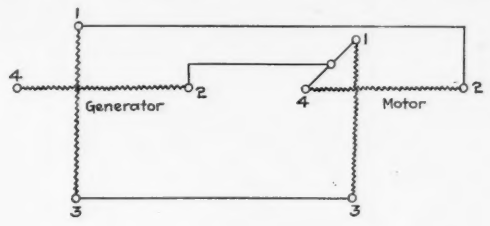



*Fig. 2.*

**Diagrams of Motor and Generator Connections.**

There are also two 50 kilowatt 125 volt General Electric exciters each direct coupled to a 75 horse-power 10½ in. x 10 in. simple automatic Harrisburg engine. Either exciter running at 285 revolutions per minute is capable of exciting the whole plant, and supplying lights for the power station and office building. The 3½ in. steam pipe of each 75 h.p. engine draws its supply from the 8 in. steam lead of the 600 h.p. engine, and the exhaust pipe leads into the 14 in. exhaust pipe of the larger engine.

In addition to the foregoing apparatus there are two 150 kilowatt, 2 phase, 60 cycle General Electric rotary converters running at 900 revolutions per minute, each rotary running from a separate pair of 90 kilowatt transformers supplying alternating current at 180 volts and the rotary delivering direct current at 250—125 volts. The three-wire system on the direct current end of the rotaries is obtained by means of a neutral wire run from secondaries of the alternating current transformers.

The switchboard is arranged with the total output and exciter panels in the center, with the feeder panels on the right and generator panels on the left and room for additions to both ends. In addition to this board there is a similar board for controlling six 50-light General Electric series alternating current 6.6 ampere oil cooled lighting transformers, each arranged for either one 50-light or two 25-light circuits, the power being used for lighting the main locomotive shops, car shops, general storehouse and Reading yards.

In addition to the arc circuit, there is also brought to this board all power circuits which are exposed to the effects of lightning. All the cables and wires supplying the locomotive shops are run in conduits under ground and are not exposed to lightning. All the lighting circuits and overhead power wires are thoroughly protected with lightning arresters.

*Cleaning-Pit House.*—The track which runs across the north end of the locomotive shop continues on into the cleaning-pit house, which is 50 ft. long and 44 ft. wide. The building is brick with steel roof trusses and has a monitor on the peak. A 15,000 lb. air hoist crane having a span of 40 ft. 1½ in. and a clear height of 16 ft. 2 in. has runways supported on top of steel columns.

On each side of the railroad track in the center of the building is a cleaning-pit for holding a weak solution of lye. Each pit is 20 ft. long, 10 ft. wide, and 8 ft. 6 in. deep, the side walls extending 3 ft. above the floor level. The pits are lined with ⅜ in. steel plates on sides and bottom, and the foundations are concrete 12 in. thick. The walls are brick 17 in. thick below the floor level and 12 in. thick above. The floor of the building consists of asphalt 1 in. thick on a concrete foundation 4 in. thick.

The space between the locomotive shop and pit house is paved with cement. Each pit has a 3 in. clean out pipe and the floor of the building is also sloped and drained. The tracks rest on 6 in. x 12 in. creosoted blocks which in turn rest upon the ties. The space between the tracks is asphalt and slopes from the rails towards a gutter in the center. This in turn drains towards both ends.

*Office Building.*—This building is a three-story brick and wood structure north of the main entrance. It is 96 ft. long and 43 ft. wide. It will contain the offices of the Superintendent of Motive Power and mechanical department. Each floor will be provided with toilet and locker rooms and the first and second floors will each contain a vault 16 ft. x 9 ft. The blue printing and photographing rooms and the offices of the Chief Draughtsman and Electrical Engineer together with the draughting room will be on the third floor. This latter room is 55 ft. x 39 ft. and 14 ft. high.

*Motive Power in the Shops.*—The shops are driven entirely by motors, and all motors up to 40 horse-power are of the 2 phase, 60 cycle, induction type without compensators. These motors are controlled by means of four-pole double throw switches and the usual use of compensators is dispensed with by having three voltages on the supply mains coming from the generator, the arrangement being, as shown by Fig. 1. The different voltages are obtained by connecting the two single phase windings of the generators at points near the center as shown. The starting connections of the motors is as shown by Fig. 2. No difficulty is experienced in starting motors in this way up to 40 horse-power, and the cost and complication of compensators is avoided, and no extra cost in the generators is entailed. The generators are also easily run in multiple with these connections.

The cranes throughout the plant are operated by General Electric standard railroad direct current motors with the General Electric magnetic blowout controllers. There are but four sizes of motors used throughout the plant in order to make repairs simple and to reduce the number of repair parts to be kept on hand to a minimum. Motors used on bending rolls, cupola blowers and other machines requiring variable speed, are motors of the same type and form as those used on the cranes in order that they may be interchangeable and reduce the number of spare parts to a minimum. They are run from the three-wire system of the rotaries in order to get two voltages for speed changes.

The cupola blowers, of which there are two, are each supplied with a General Electric 44 horse-power motor, and are cooled in an ingenious way by piping the suction end of the cupola blowers to the motor by means of galvanized iron pipe in such a way that 400 cu. ft. of cool air per minute will pass through the motor. In this way the length of time which the motor could operate at full load was increased 300 per cent. with a very little expenditure of energy.

*Electric Lighting.*—The detail illumination of the plant is supplied by incandescent lights run from two transformers, one of 40 kilowatt capacity in the main erecting shop, and one of 30 kilowatt capacity in the forge shop. These two points are central and from which secondary lighting mains radiate. The mains are arranged on a three-wire system and brought to the blades of a three-pole double throw switch, the upper jaws of which are connected to the secondaries of the lighting transformer and the lower jaws connect to the rotary converter mains. By this arrangement the lights can be thrown to the rotary circuits in case of failure of the lighting transformer, or vice versa. A standard 16 candle power 120 volt incandescent lamp is used throughout the plant.

The draughting room, on the third floor of the office building, is to be illuminated by means of the ceiling reflecting method, there being eight direct current arc lamps suspended 4 ft. from the ceiling with reflectors underneath the arc, throwing light to the ceiling, which will be of a light tinted color, and from there the light will be reflected downward and diffused. The office building will be lighted from a separate circuit supplied by the exciters in the power station.

The general illumination of the plant is obtained through arc lights, the system used being the General Electric series alternating current enclosed lamps using 6.6 amperes with 80 volts at the terminals. There are now 175 lamps in operation and others being installed which will bring this number to a total of 250 in the near future.

On the cab rack stands between the locomotive pits are plug receptacle boxes, into which portable lamps may be connected and carried by means of flexible cords under the locomotives or into the boilers or fire-boxes. Nothing suited to the rough usage of the locomotive shops could be found on the market, and the boxes were designed and built by the railroad company. This arrangement is giving good service and allows the use of a clear steady light in place of smoking unsteady oil torches formerly used.

*Washrooms.*—In accordance with modern shop practice every building has one or more washrooms with convenient lockers for the workmen. These rooms are large, and in the main shops, are built in side wings.

Acknowledgments are due Mr. S. F. Prince, Superintendent of Motive Power; Mr. E. E. Brown, Electrical Engineer; Mr. E. L. Moser, Chief Draughtsman, and Messrs. Wilson Bros. & Co., now Wilson, Harris & Richards, for the information and assistance which made this article possible.

## Railroads in South Africa.

In *The Iron Age* of December 4 appears an important letter from a London correspondent. This letter is a condensation of a report compiled by Mr. B. H. Morgan on the engineering trades of South Africa, which report may be had from Messrs. P. S. King & Son, 2 and 4 Great Smith street, Westminster, London. We have space here to reproduce only that part of the letter (not of the report) which especially concerns railroads.

American competition is making itself felt in the railroad politics of South Africa. Thus, in the report, I read:

There is a danger that with the development of railroads in South Africa we shall see an increased import of American rolling stock, plant and material, and this for the following reason: The railroad conditions which obtain in South Africa very closely resemble those in the United States and Canada. The area of the country is great, as are the distances between centers, and the partially developed condition of portions of the country presents problems which are thoroughly appreciated by American engineers, who have to provide for similar conditions in their own country. I am convinced that with a thorough understanding of the railroad position the British engineer could hold his own without much difficulty, but I am informed by heads of various South African railroad departments that at present he does not thoroughly understand them. He does not seem to be able to get away from his long experience in dealing with dense populations, heavy traffic and relatively short distances between all centers as is the case with Great Britain.

In the matter of rolling stock America undersells Great Britain in locomotives, carriages and wagons, but the railroad engineers seem to be generally of opinion that the British production, though perhaps not sympathetically meeting the conditions, is of superior make, giving less trouble and costing less for repairs, renewals, oil and fuel. In consequence of this, in selecting tenders, the British article is given an advantage of 10 per cent. In the matter of delivery, Great Britain has lost a great deal of business.

Mr. Morgan is a strong advocate of standardization. On the Cape Government railroads the nearest approach to standardization has been obtained. It was found a few years ago that the eight-coupled, seventh class, although good engines for their size, were not as heavy and powerful as they might be. A design was therefore got out by the locomotive engineer in the early part of 1900 for an eight-coupled, with single leading bogie. Two of these engines were ordered from the Schenectady Locomotive Works in May, 1900, and put to work in March, 1901. They have fulfilled expectations, and a further order for 14 similar locomotives is now being executed. Twenty-three similar locomotives, but with a four-wheel leading bogie and shorter fixed wheel-base, are being built by Nelson, Reid & Co., of Glasgow. There are other American engines at work, notably 10 supplied in 1901 by the Baldwin Locomotive Works. Last November tenders were invited by the Cape Government for the supply of 24 locomotive engines and tenders, with the following result:

| | Price. | Specified time for delivery. |
|---|---|---|
| British | £94,160 | 52 to 65 weeks |
| American | 77,940 | 36 to 43 weeks |
| German | 78,248 | 36 to 41 weeks |

The orders for these 24 locomotives were given to the British firms, but it is clearly stated that these conditions will not obtain in future. In the matter of cattle wagons the Hungarians have secured the trade. It would be superfluous to quote the experience of the Natal, Transvaal and Orange River Colony railroads, as it is very much a duplication of what has been stated in regard to the Cape Colony. The American locomotive engineer is forging ahead in South Africa. But I must not enter into further particulars in regard to the railroads of South Africa. Those interested will obtain the report and study it for themselves. Just one word of warning. It is stated that British carriage and wagon builders are now able to quote lower prices than formerly. A British firm will now sell a truck for £480 for which two years ago they charged £600 and for £190 what was previously sold for £290. The amalgamation in this country of the rolling stock concerns, of which I have kept readers of *The Iron Age* fully informed, must help enormously in economic production. That there is plenty of room for greatly increased American competition will be evidenced by my stating the proportion of orders placed with Great Britain, America, Germany and Holland. The period over which these orders were placed is not mentioned, but they are figures supplied by the Cape Government for locomotives, carriages, trucks and stores:

| | £ | s. | d. |
|---|---|---|---|
| To manufacturers or suppliers in Great Britain | 908,834 | 0 | 9 |
| To manufacturers or suppliers in America | 68,307 | 14 | 2 |
| To manufacturers or suppliers in Germany | 4,653 | 9 | 6 |
| To manufacturers or suppliers in Holland | 693 | 15 | 1 |
| Total | 982,488 | 19 | 6 |

## Some Notes on the Paris, Lyons & Mediterranean Railroad.

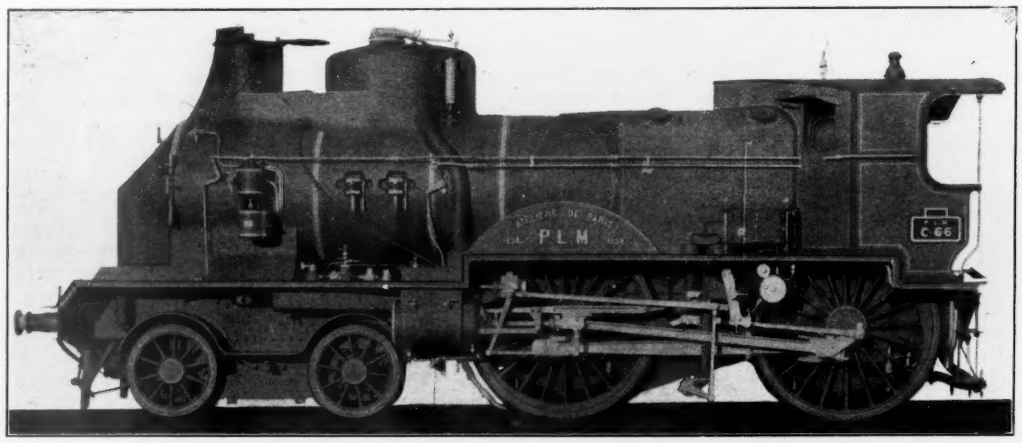
*General Description.*—This railroad company, the largest in France, has its "sphere of influence" in the country bounded (approximately) on the northeast by the Eastern and on the west by the Orleans and on the south by the sea. In the large area from which it derives a goodly part of its business are to be found some of the most prosperous manufacturing districts, as well as the great winter health resort of Europe—the Riviera. Furthermore the company has a monopoly of the very profitable traffic to and from the port of Marseilles.

The Paris, Lyons & Mediterranean forms one of the great channels of international traffic between Great Britain and India, via the port of Marseilles and also the Mont Cenis route. These are, however, not the only points where it interchanges traffic. Swiss merchandise is delivered at Pontarlier and Geneva, and the Spanish frontier is reached at Cette, where the Barcelona traffic is handled. When the new Simplon tunnel is finished it will have an alternative route for Italy and India. These facts show the important position occupied by this railroad as a factor in international service. On its system are the towns of Dijon, Lyons, Marseilles, Nice, Nimes, St. Etienne, Ferrand, Chambery, Besançon and other important and flourishing traffic centers.

The most profitable traffic which this line handles is that to the Riviera from England and all parts of the Continent. Some idea of the train service may be gained, when it is stated that Nice, 678 miles from Paris, has one train which makes the trip in 15, and two other trains in 17 hours respectively, also a limited, composed only of sleepers, which goes through in 15 hours. The train service over the Mont Cenis route to Italy has always been one of the best on the line, competing with that of the St. Gothard railroad. The best P. L. M. train on this section runs the first 285 miles to Bourg in 6½ hours, including stops. Turning to the fastest through runs, we find that the 77½ miles from Valence to Avignon are, twice daily, booked to be run in 87 minutes, and the 100 miles between Dijon and Laroche, in 113 minutes. The track on the main lines is now laid with rails weighing about 87 lbs. to the yard, of the Vignoles (flange) pattern and spiked direct to the ties. The length of the new rails is 60 ft., instead of the old standard of 40 ft.

*Locomotive Department.*—To sketch briefly the locomotive history of this line, it is necessary to go back to the year 1880, when the engines of class 111 to 400 were begun. This class was composed of simple engines with 6 or 7-ft. driving wheels, Belpaire fire-box and 156.4 lbs. steam pressure. This class was the only one used for express trains, until the introduction of compounds in 1889. Ten years or more ago their long rigid wheel base was considered undesirable for high speeds, and some have been rebuilt as the B class with a bogie in front and no trailing or carrying wheels, but with a shorter boiler and no increased steam pressure.

From this class we come to the compounds. They were first introduced in 1889 by M. Henry, the Locomotive Superintendent. With him was associated the present superintendent, M. Baudry. Two engines were built, Nos. C-1 and C-2. They were of the same type as that now being used, but were in outward appearance like the old simple class of 1880. The prefix letter C to an engine number on this line denotes one of the classes for fast work, of which there are two. The small C-21 to C-60, the first that can be called a regular class, and the newest C-61 to C-180, which are enlarged and improved copies of the former class.



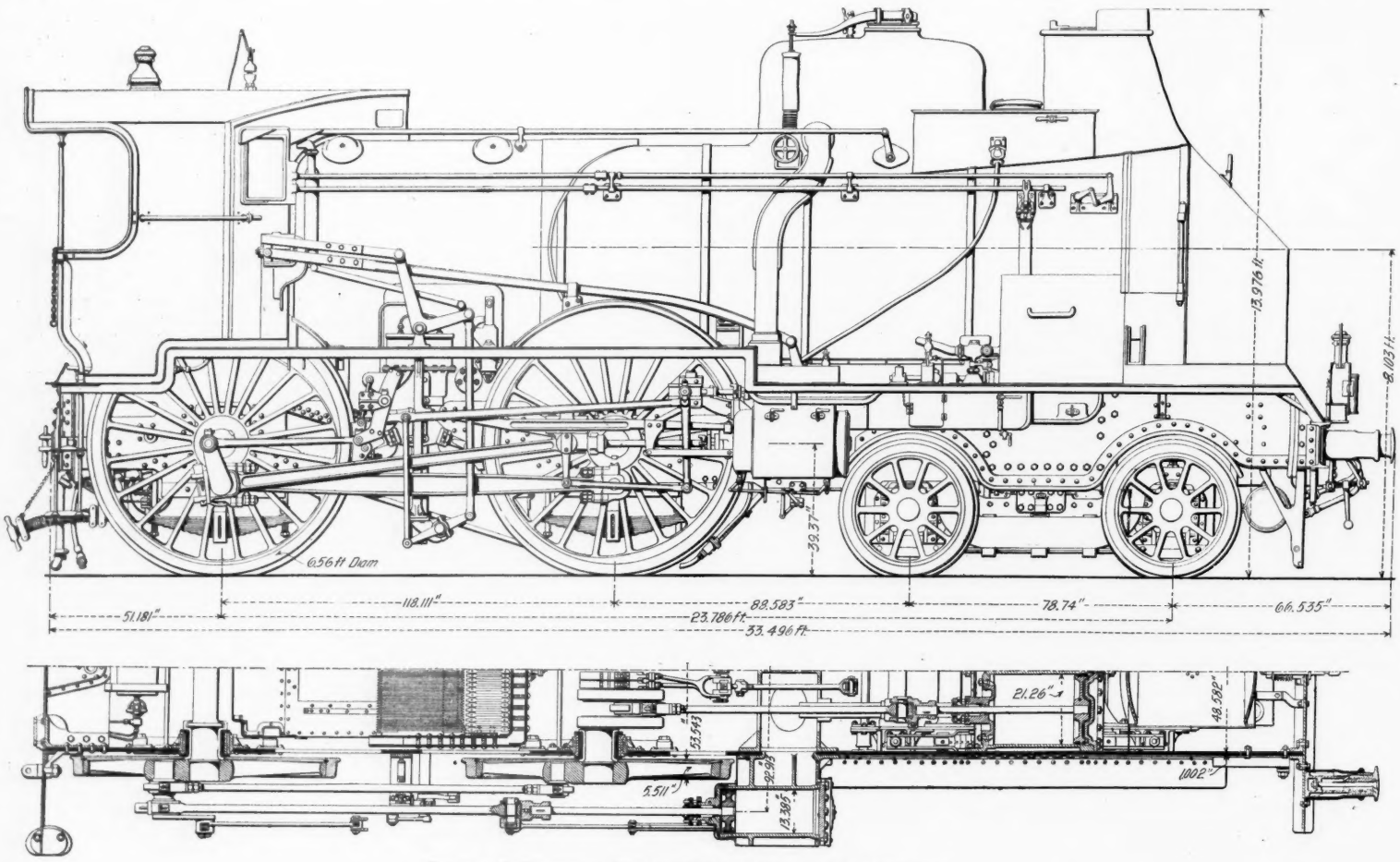

Compound Passenger Engine—Paris, Lyons & Mediterranean.

There were several alterations from the design of the simple engines, apart from the introduction of compounding. One was the raising of the steam pressure from 156.4 to 213.3 lbs. per sq. in. It was considered that the lower pressure was insufficient to obtain all the advantages of compounding. To avoid undue thickness of the boiler plates, steel was used instead of iron, and the tubes were also made of steel, with a length of 10 ft. 10 in. The grate area is about 23 sq. ft. and the ratio of tube to grate is 72 to 1, in the compounds, and 57 to 1, in the simple engines. The valve gear now used is Walschaert for the high pressure, with Gooch for the low pressure cylinders. There is another class, C-3. This is practically the C-21 to C-60 class, without bogie and carrying wheels.

The system of compounding used on the P. L. M. should not be confused with that designed by M. de Glehn, the only point in common being that each has four cylinders, two high and two low-pressure. The first engines designed by M. Henry had the high pressure cylinders inside, driving the forward, and the two low pressure outside, driving the trailing wheels. This arrangement has been reversed in the later engines.

The grate is set at an incline of 17 deg. A brick arch is placed in the fire-box and "serve" tubes are used in the "C" classes. The smokestack is larger than that which ordinary practice prescribes, and to obtain the necessary draught, there is fitted in it a cone with a series of holes at its base, so arranged as to fill the whole stack with the exhaust steam. A variable exhaust nozzle is also in use, which can be controlled from the cab. This device is spoken of most highly by the enginemen. Just above the fire-box door there is a small hole about 3 in. in diameter, through which the fireman can see the fire and tubes. A most troublesome feature of the "serve" tube is that, with certain kinds of coal, a mask of clinker forms in the opening of the tube, which requires a special form of iron tool to remove it.

The first of the C-21 to C-60 engines built as a class of compounds were begun in 1892 after the trial stage had been passed. At present they are only used on the main line from Paris to Laroche, where the grades are light and the schedule is slow. With this class it is exceedingly difficult to maintain steam pressure at more than 195 lbs. The new engines, however, are almost in every way a larger edition of this class. The cab is well arranged, as may be seen in the illustration; all the necessary levers, etc., are within easy reach of the engineman. The cab is warm, and gives excellent protection against side winds or rain.




Compound Passenger Engine—Paris, Lyons & Mediterranean.

The large "C" engines have proved themselves to be most satisfactory machines, the grate area has been very much increased as well as the diameter of the boiler barrel, while the size of the cylinders and the steam pressure remain the same. No difficulty is experienced in keeping up the steam pressure, even when these engines are working very hard. The cab is larger and is carried further back and is supported on two pillars; it comes well over the foot-plate and thus affords excellent protection to the men.

The service required of this large "C" class is the hauling of trains of 190 tons up the long 1 in 125 grade to the summit at Blaisy, at a scheduled speed of 45 miles an hour. The principal dimensions of the class C-61, C-180 engines follow:

| | |
|---|---|
| Weight on driving wheels | 16.73 tons |
| *Weight on trailing wheels | 16.73 tons |

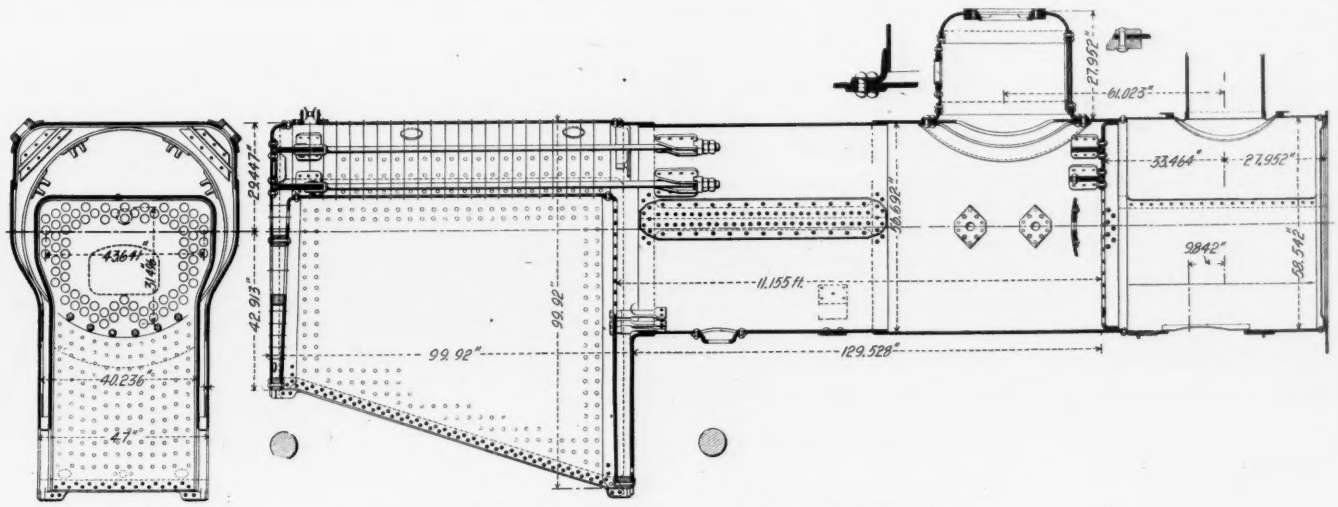
| | |
|---|---|
| Weight on truck wheels | 10.99 tons |
| Weight, total | 44.45 tons |

*General Dimensions.*

| | |
|---|---|
| Length over all, engine | 33 ft. 6 in. |
| Height, center of boiler above rails | 8 ft. 1¼ in. |
| Height of stack above rails | 14 ft. |

come to rest. The long space of unmarked paper shows the duration of the stop. The name of the station and the time of arrival were filled in after the trip. The start, not shown, was made at 6:58, and the vertical lines of the striker gradually close together as the train

to a weighing machine and the amount in the tip-car made up to, or reduced to, 1,102 lbs., as the case may be, after which it is ready to be placed on the tender. Each engine driver is allowed a fixed quantity of slack with lump coal or briquettes; this he gives a receipt for.




**Boiler of Paris, Lyons & Mediterranean Compound Locomotive.**

| | |
|---|---|
| Heating surface, fire-box | 129.2 sq. ft. |
| Heating surface, tubes (inside only) | 1805.3 sq. ft. |
| Heating surface, total | 1934.5 sq.ft. |
| Grate area | 26.4 sq. ft. |

*Wheels.*

| | |
|---|---|
| Drivers, number | 2 |
| *Trailing wheels, number | 2 |
| Drivers, diameter | 6 ft. 6¾ in. |
| Truck wheels, diameter | 3 ft. 3⅜ in. |

*The rear drivers are designated "trailing wheels."

*Cylinders.*

| | High pressure. | Low pressure. |
|---|---|---|
| Cylinders, number | 2 | 2 |
| Cylinders, diameter | 13⅜ in. | 21¼ in. |
| Piston, stroke | 25 7/16 in. | 25 7/16 in. |
| Center to center of cylinders | 7 ft. 0¼ in. | 1 ft. 11¼ in. |
| Length of connecting rod | 8 ft. 8 7/16 in. | 6 ft. 6¾ in. |

*Valves.*

| | High pressure. | Low pressure. |
|---|---|---|
| Valve motion | Walschaert | Gooch |
| Valves, greatest travel | 4 13/16 in. | 4 15/16 in. |
| Valves, outside lap | 1 1/64 in. | 1 11/32 in. |
| Valves inside lap | 0 | 0 |
| Valves, maximum admission | 74 per cent. | 63 per cent. |

*Boiler.*

| | |
|---|---|
| Boiler, working steam pressure | 213.3 lbs. |
| Diameter of barrel | 4 ft. 8¾ in. |
| Length of barrel | 10 ft. 9⅝ in. |

*Fire-box.*

| | |
|---|---|
| Length | 8 ft. 7¼ in. |
| Width (top) | 4 ft. 11 3/16 in. |
| Width (bottom) | 3 ft. 11 1/16 in. |

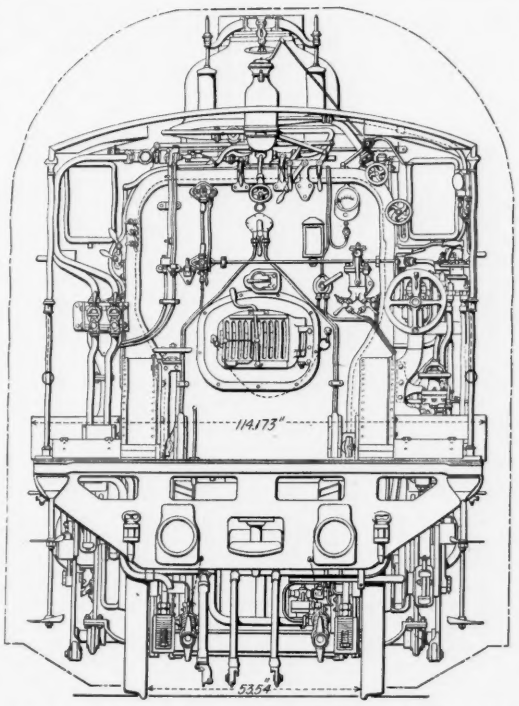
*Tubes.*

| | |
|---|---|
| Number | 150 |
| Material | Steel |
| Outside diameter | 2½ in. |
| Thickness of metal | .098 in. |
| Number of ribs in each tube | 8 |
| Length between tube plates | 11 ft. 1 15/16 in. |

*Stack.*

| | |
|---|---|
| Inside diameter | 21¼ in. |
| Maximum diameter of cone | 10⅝ in. |

*Speed Recording Apparatus.*—A machine called the "chrono-tachymetre" is fixed on the engine above the running board between the splashers of the driving wheels. It is connected with the side rod, by a rigid bar which causes a striker to descend and mark the paper every four revolutions of the driving wheels, and as every kilometer (nearly five-eighths of a mile) measured by the turning wheels, is passed, a little hammer falls, making a triangular mark on the paper. A clock causes the drum, around which the record paper is wrapped, to revolve once every 15 minutes. The paper is divided into one-minute sections. When the drum has made one revolution it is shifted in the direction of its own axis about $^{3}/_{10}$ of an inch, and this enables the striker and hammer to begin a new line. Four lines, therefore, represent an hour. The instrument is locked at the roundhouse and cannot be opened except upon its return. A portion of the record made on engine C-152 from Marseilles to Nice Feb. 1, 1902, is given. The record of the stop at St. Raphael is shown. It will be noticed that as the brake is applied the little vertical lines made by the striker, every four revolutions, gradually draw apart, with wider spaces between, until at 6:54 the train has




**Interior of Cab of Class C-21 to C-60—Paris, Lyons & Mediterranean.**

increases in speed. The distance between each vertical line in this record represents a distance of about 84 ft. neglecting slipping.

This mechanism does not help the engine driver directly. There is, however, a speed indicator in the cab for the use of the driver. It consists of a long glass tube with speeds marked at the side. The drivers operate a small centrifugal pump which forces a liquid up in the tube, the height in any case depending upon the speed.

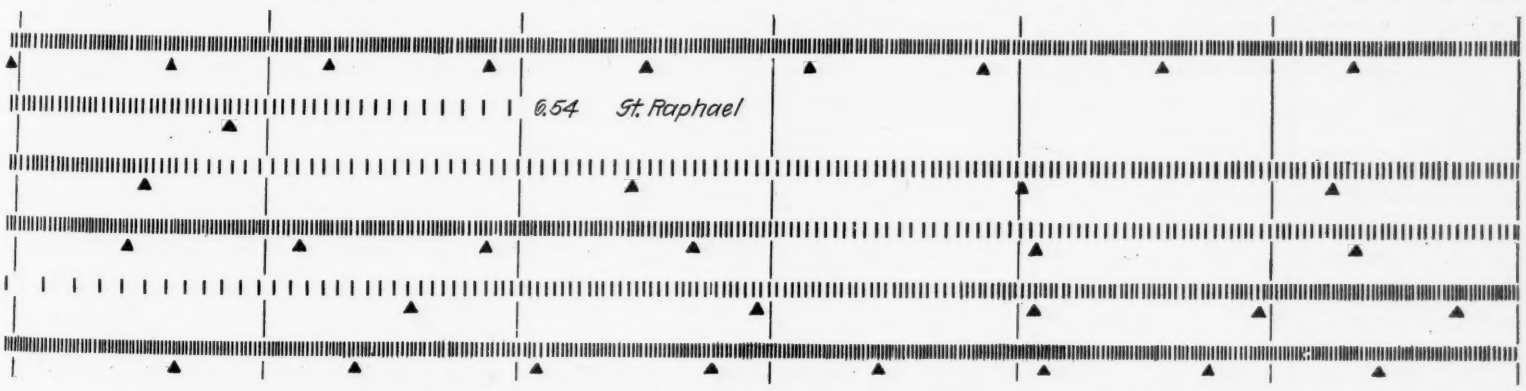
*Coal, Oil and Cleaning.*—This company pays, perhaps, more attention to the question of good coal for express engines than any other in France. On the line south of Lyons, Welsh coal is used exclusively on the "rapides," as the fast trains are called. This coal is brought to Marseilles by sea. The coal comes to the roundhouse in trucks, it is shoveled into tip-cars, holding about 1,100 lbs. These run on a narrow gage railroad, and are hoisted to the staging by a steam driven lift, fitted with an automatic stop. After being hoisted the coal is run to a weighing machine and the amount in the tip-car made up to, or reduced to, 1,102 lbs., as the case may be, after which it is ready to be placed on the tender. Each engine driver is allowed a fixed quantity of slack with lump coal or briquettes; this he gives a receipt for. The total cost of the coal from truck to tender is 7.6 cents per ton.

The price of coal is such as to render it essential to effect every possible economy, and to this end, coal premiums are paid to the drivers. This plan is, of course, liable to great abuse by those who are more anxious to save coal than to do credit to the road. A check has therefore been put upon economy at the expense of schedule time keeping, by the introduction of a system which may appear somewhat complicated, but which certainly seems to give excellent results. For each minute gained, the engine driver is paid 13 cents, up to 10 minutes and above that figure, each minute gained, brings him 20 cents. This premium payment is reckoned to work out at decidedly more than the cost of the extra coal burned in making up time, and thus makes it worth while for the men to make up time when required to do so. On the other hand, a driver is fined proportionately for loss of time. Each engine is allowed a fixed amount of coal, and a system has been introduced by which an engine receives its maximum loading for the speed of the train. The gradients are taken into account and each section of the line has its own separate load. Each weight of train has its own speed, consequently should a driver have considerably under his load, it is possible that, if he is late, and does not make up all the time, he may yet be fined.

The P. L. M. does not use sight-feed lubricators for cylinders, etc. It still retains the hand lubricator. A piston is fitted in this hand device, which being forced down by screw pressure drives oil into the cylinder. The company uses colza oil, which is low in cost, and excellent results are obtained. Experiments are being made with mineral oil fed through sight-feed lubricators, but the company finds that with hand oilers and colza oil, the pistons are more greasy and the wear of cylinders is reduced to a minimum. The hand oiler is, of course, open to the objection that a driver may neglect to use it.

*Performance of Engines.*—The heavier C-61 to C-180 class engines are used on the section extending from Laroche to Dijon. There is a steady rise for the first 83 miles from La Roche, ending with a long stretch of 1 in 125 grade. The grades on this section are so heavy that the load is one ton less, even with the large "C" class engines, than it is on the easier line from La Roche to Paris for the small "C" engines. A stop, and slow running, after Blaisy are required by the permanent way department for some repairs in the tunnel.

On one particular trip with engine C-172, with 182 tons load, the first 66¼ miles to the stop at Valance was run in 72½ minutes with two slow downs in the first 15 miles out of Lyons. From there the next 77½ miles were covered in 83½ minutes, including a signal stop 34 miles from the start, which cost 3½ minutes, leaving the net time 80 minutes, and giving an average speed of 58 miles an hour.




**Portion of Record Obtained from "Chrono Tachymetre"—Paris, Lyons & Mediterranean Railroad.**

## The Blackwell's Island Bridge Plans.

The Bridge Commissioner of New York, Mr. Lindenthal, is still opposed to building the Blackwell's Island bridge over the East River according to the original plans which provide for a bridge 120 ft. wide. The Citizens' Committee of Forty of Long Island City, which has been very active in opposing a reduction in the width of the bridge to 80 ft. according to Mr. Lindenthal's plans, has received the following letter from R. S. Buck, who made the original plans, and who is now Chief Engineer of the Dominion Bridge Company:

I have your favor of the 12th inst., requesting me to inform the Committee of Forty if any progress has been made in the details of the Blackwell's Island Bridge at the expiration of the term of Commissioner John L. Shea.

In reply, I beg to state that progress had been made in the preparation of detail plans for the main bridge to the extent that the substructure contract was let and the work under way; that the preparations of contract drawings for the superstructure were under way and it was estimated that these would be ready for inserting bids, letting the superstructure contract and beginning the erection of same by the time the two Blackwell's Island piers were completed. In the light of subsequent progress on substructure work, there is no reasonable ground for doubt that this estimate as to time would have been more than realized.

The plans on file in the Department of Bridges show quite fully the amount of work done in preparing details for superstructure according to the original plans.

## A New Reclining Chair.

The perfecting of a reclining chair for railroad service by the Richards Chair-Panel Co., Chicago, was noted in our issue of Sept. 26. The distinctive feature of the Richards chair is a pivoted panel back, the purpose of which is to furnish restful support to the back of the occupant in almost any position of erectness he may assume. This panel, which occupies the width of the chair-back within the frame, and extends from the seat to the head-rest, is pivoted to the frame at each side at about one-fifth of its height from the seat and is retained in its normal upright position by a coil spring in the pivot device on each side. As the occupant leans back in the chair the shoulders drop under and slightly back of the head-rest, carrying the panel with them and rotating it forward at the bottom so that this part comes against the small of the back, fitting it snugly; at the same time the head lies comfortably against the head-rest. As the passenger changes position the panel follows his motion, adapting itself to the poise of the body. The panel back feature should correct the tendency of the passenger to lounge down in the seat as the lounging position causes considerable discomfort and the occupant must sit reasonably erect to get the benefit of the panel. The pivot springs absorb much of the vibratory jarring of the car, thereby saving the passenger much fatigue.

**Richard's Panel Back Reclining Chair.**

*Panel held back showing limit of action when occupied.*

The Richards panel-back chairs have been in limited use for more than nine years, and the Pullman Company has used the panel feature in chairs for its parlor cars since the time of its introduction. Within the past year their general introduction has been undertaken and the application of the panel feature extended to embrace a variety of chairs. The most important of these is the reclining chair, and the design embodies some interesting features, of which next after the panel back is the leg-rest. This has a side swing of several inches each side of the center so that if the passenger desires to assume a sidewise position the leg-rest may be deflected sufficiently to add considerably to the comfort of the posture. This arrangement also permits the occupant to take advantage of the unoccupied space between the pedestals of the chairs in front, preventing a cramped position. The chairs are made to revolve so that they may be turned to face either direction.

It is claimed for these chairs that they will increase the seating capacity of reclining-chair cars without reduction of the space necessary to the comfort of passengers. They are spaced 40 in. center to center, and a 70-ft. car can be equipped with 64 chairs, and cross seats in addition sufficient to give 75 seatings without crowding.

The side frames of the chairs are formed of light box castings securely bolted to the seat frame. The back frame is hinged to the side frames and is strengthened by wrought-iron angle pieces at the joints. The position of the back is controlled by a rack and spring-pressed latch under each arm, the latch being located in the side frame and presses upwardly. This latch is operated by a small lever on the front of the side frame just under the arm. By raising the two levers the back is permitted to drop down to an intermediate or an extreme position as the occupant desires. The lowering of the back is retarded by coil springs in the pivotal joints between the back and side frames.

An admirable feature in connection with this chair is the possibility of easily removing the panel back and the seat and substituting wicker parts for summer service.

The use of the panel-back on parlor car chairs has already been mentioned. It is also applied to library and observation car chairs, and, in fact, to every style of chair made.

The office of the Richards Chair-Panel Co. is in the Woman's Temple, Chicago.

## Malleable Castings Consolidation.

Negotiations which were carried on for over a year have been completed for the consolidation of the malleable castings concerns of the country. The consolidation as arranged includes 17 companies, as follows:

Albion Malleable Iron Co., Albion, Mich.
Beaver Dam Malleable Iron Co., Racine, Wis.
Belle City Malleable Iron Co., Racine, Wis.
Chicago Malleable Castings Co., West Pullman, Ill.
Chisholm & Moore Manufacturing Co., Cleveland.
Marion Malleable Iron Works, Marion, Ind.
Michigan Malleable Iron Co., Detroit.
Missouri Malleable Iron Co., East St. Louis, Ill.
Moline Malleable Iron Co., St. Charles, Ill.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Pittsburgh Malleable Iron Co., Pittsburgh.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Springfield Malleable Iron Co., Springfield, O.
Trenton Malleable Iron Co., Trenton, N. J.
Waukesha Malleable Iron Co., Waukesha, Wis.
Whiteley Malleable Castings Co., Muncie, Ind.

The capital stock will be $20,000,000, half common and half preferred. Of this $16,000,000 will be issued to the stockholders of the 17 companies for their holdings, no cash being paid for the stock of any of the concerns taken in. The committee which made the arrangements was as follows:

W. C. McMillan, Detroit; O. P. Letchworth, Buffalo; C. P. Bostford, Pittsburgh Malleable Iron Co., Pittsburgh; F. E. Nulsen, Missouri Malleable Iron Co., East St. Louis, Ill.; T. H. Simpson, Michigan Malleable Iron Co., Detroit; F. W. Sivyer, Northwestern Malleable Iron Co., Milwaukee; W. B. Ullman, Moline Malleable Iron Co., St. Charles, Ill.; B. H. Whiteley, Whiteley Malleable Castings Co., Muncie, Ind.

Mr. McMillan will probably be made President of the consolidated company and the present officers made managers of the different plants. Financial headquarters will be in New York and manufacturing headquarters in Detroit or Chicago.

"The object of the consolidation," as stated by Mr. McMillan, "is to work economies which will greatly cheapen the cost of material and, in addition, assist in the more rapid and efficient production of malleable iron, with the view of enabling consumers to be more promptly supplied. The trade will be controlled by the one set of officers, and orders will be filled as far as possible at the plant nearest to the consumer. In other words, castings for the American Car & Foundry Co. will be made at the Michigan plant, while the work that is now being done for distant companies by the Michigan plant will hereafter be done at a nearer factory. In this way the cost is cheapened, and the consumer gets the benefit of the time saved."

It is likely that the Michigan plant will be enlarged. None of the plants will be closed.

It will be noticed that the works taken over include, but with one exception, western and central western plants. The principal company which did not join the consolidation is the National Malleable Castings Co., which controls a number of plants and is expanding.

## Ingoldsby Cars in Sugar Beet Service.

It is known that the Colorado & Southern has a large number of Ingoldsby dump cars in service, which were purchaser for use in its coal and ore service. Sixty-one of these cars were assigned to the traffic in sugar beets intended for the Loveland, Colo., sugar factory and the results from their use have been so satisfactory, and they have so greatly expedited the handling of this commodity as to receive the especial commendation of all concerned with this particular service.

Mr. Frank Trumbull, President and General Manager of the Colorado & Southern, has just had issued a table showing the movement of these 61 cars into and out of the Loveland factory during the period from Sept. 20 to Oct. 31. During the first part of the period, up to the early part of October, the movement as shown by the report was not very lively. This was due to wet weather delaying the loading; but the movement showed constant increase during October and for the last two weeks the entries are pretty thick.

The system employed in making these entries was to indicate two trips per day by "A," three trips in two days by "B," and one trip in one day by "C." The summary shows 24 of "A," 10 of "B" and 708 of "C."

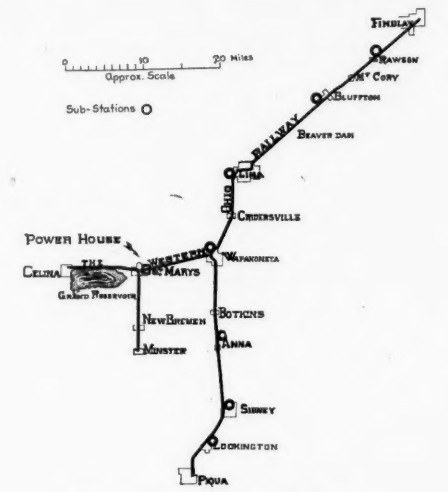
For the last 15 days of October, not including Sundays, the average daily movement was 36.6 cars, or 60 per cent. of the total number in the service. All of the "A" and "B" movements occurred during this period. This is a good illustration of the adaptability of these cars and the facility with which dumpable products may be handled by their use.

## Engineering Features of the Western Ohio Railway.

BY D. W. PELL, *Superintendent of Construction.*

The Western Ohio Railway Company operates 47 miles of road and has under construction 64.5 miles more. The line now in operation begins at Lima, in Allen County, Ohio, runs south from Lima to Cridersville and Wapakoneta, west to St. Marys, south from St. Marys to New Bremen and Minster, and finally west from St. Marys to Celina.

The main power house at St. Marys is indicated on the map by a rectangle. The general dimensions are,




**Map of Western Ohio Railway.**

extreme width 104 ft., extreme length 248 ft., width of boiler room 45 ft., and width of engine room 52 ft. The floor level of the boiler room is 12 ft. lower than that of the engine room and under the latter there is a 12-ft. basement. This basement will be used, when the plant is completed, as a stationary transformer room. The engine room floor consists of steel "I" beams with brick arches filled in between with concrete. The roof over the entire building consists of flat steel trusses carrying 3-in. tile, with a four-ply asphalt and gravel covering. The engine room is supplied with a 25-ton Chisholm & Moore hand-power traveling crane.

The maximum capacity of this station, according to the present plans, will be 4,000 k.w. Just now, however, only two 400-k.w. machines are installed and foundations have been completed for two 750-k.w. generators. The engines are horizontal, cross-compound, condensing with Corliss valve gear and were designed for parallel operation on alternating current three-phase work, with a guaranteed regulation of 1 per cent.

The boiler equipment consists of eight Stirling boilers, with a total capacity of 6,000 h.p. These boilers are equipped with flat grates and are all hand fired, coal being supplied directly in front of the fire doors by a Hunt industrial railroad system.

The pump and condenser room is in the center of the main boiler room and contains all of the feed pumps, feed-water heaters, circulating pumps, vacuum pumps and condensers for the entire plant. The 30-in. Worthington elevated injector condenser includes an 8 x 16 x 12-in. rotative, dry, vacuum pump and two Worthington circulating pumps, either of which will be of sufficient capacity to operate the entire plant. The main steam header is carried on a specially designed, cast-iron roller frame, one end resting on the rear of the upper walls of the boiler setting, and the other being built into the brick-work of the division wall between the boiler and engine rooms.

The electrical apparatus is furnished by the Westinghouse Electric & Manufacturing Co. The main generating units are direct connected. The machines are of the revolving armature type, and since they run at 100 r.p.m. and have 30 poles, they deliver current at 3,000 alterna-

**Overhead Crossing—Western Ohio Railway.**

tions. For exciting the main generators there will be two units, both steam driven and of the Westinghouse type, the generators of 100-k.w. capacity and operating at 125 volts and 200 r.p.m., being direct connected to two 13 x 22 x 13-in. Westinghouse compound engines.

The main power house contains, also, a sub-station, that is, a portion of the low potential current from the main generators is carried to two 400-k.w. rotary converters supplying approximately 25 miles of the feeder system of the line. The rotary converters in the other sub-stations are all of the Westinghouse type and of 200-k.w. capacity.

The step-up stationary transformers, which are in the basement, are of the Westinghouse oil-cooled type. There

will be seven of 400 k.w. capacity, transforming the current from 390 to 33,000 volts. From the transformers lead-covered, single-conductor cables will be led up the south wall of the building to the high-potential circuit-breakers, of which there will be nine.

The sub-stations along the route will be as follows: Rawson, Beaver Dam, Lima, Wapakoneta, Anna, Sidney and Lockington. The locations of the various sub-stations are indicated on the map by circles.

In addition to the sub-stations mentioned, there will be a portable sub-station mounted on a car. This car will be 27 ft. long, 8 ft. 10 in. wide and 10 ft. 6 in. high from the top of the rail. The equipment includes one 200-k.w. rotary converter; three 150-k.w. step-down transformers; three "low-equivalent" lightning arresters; three-fuse switch circuit-breakers with barriers, and one three-panel switchboard, including an a.c. rotary converter panel, d.c. rotary converter panel and d.c. feeder panel.

The high tension line from Wapakoneta to St. Marys is carried on 45-ft. poles, the top of the poles being arranged for three sets of 33,000-volt lines. All the high-tension lines are completely spiralled every mile, each set being spiralled on a direction opposite to the adjoining one, thus keeping the same phase feeders on the two pins next to the pole on each side.

The first eight cars on this road were built by the G. C. Kuhlman Co., of Cleveland, and consisted of five passenger coaches and three combination passenger and express coaches. The cars are 42 ft. 6 in. over all and 8 ft. 8½ in. wide. The car bodies are mounted on Peckham No. 14AX trucks, with spoke wheels 33 in. in diameter, 2¾-in. tread, with 1 x 1 in. flange. The electrical equipment consists of four Westinghouse No. 56 railroad motors with K14 controllers. All cars are geared up to a maximum speed of 48 miles an hour with a gear ratio 30 to 52. All axles are 5 in. in diameter and the motors are mounted on the trucks with nose suspension. Straight air-brakes are used and each car is supplied with an independent motor-driven compressor mounted in a dust-proof box on the under side of the car. The Niles Car & Manufacturing Co. now have an order for 24 passenger coaches each 44 ft. 10 in. long over all and 8 ft. 9 in. wide. These coaches will have standard "I" beam framing for the floor sills and will be equipped and mounted on the same trucks and with the same equipments as those furnished by the Kuhlman Co.

The road on the first 47 miles of this property is of 60-lb. rails 30 ft. long. The bonds are of the American Steel & Wire Company's "Crown" type. The road is stone ballasted throughout. The entire line is built on private right of way. The maximum grades on the line now operating will not exceed 2 per cent., except at points where the line crosses over the main lines of steam roads. The road on the rest of the property, which is now building, will be of heavy construction, consisting of ties 6 x 8 x 8 in. placed 2 ft. on centers, and laid with 70-lb. "T" rails. The bonds are to be the American Steel & Wire Company's solid terminal type, which are to be placed by an hydraulic compressor.

The portion of the road now in operation traverses the Lima-St. Marys oil fields, which are among the heaviest oil producing districts in the country. It also traverses a rich farming territory and the prospects for freight on this road are very bright. The rate of fare charged is approximately 2 cents per mile and the run from Lima to Minster, a distance of 36.8 miles, is being made in 1 hour and 46 minutes, including all stops.

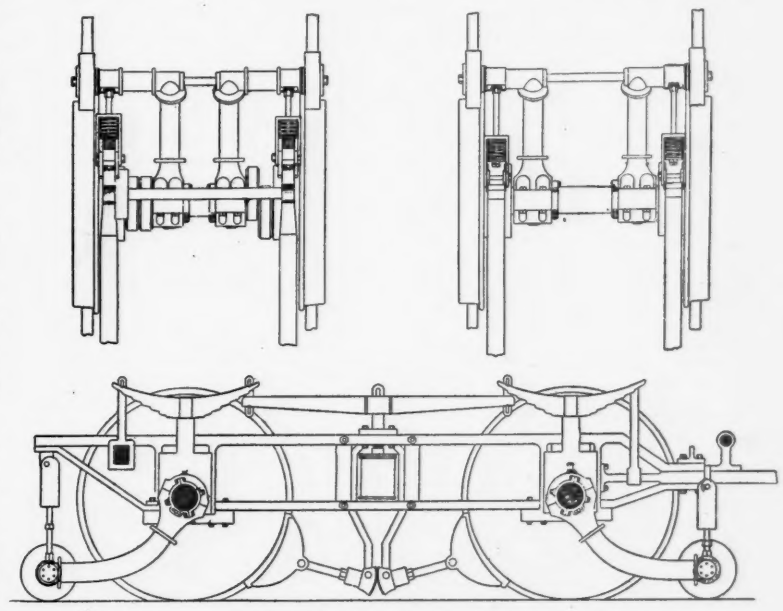
## Publicity for Interstate Corporations.

The Judiciary Committee of the Lower House of Congress has before it a bill, by Mr. Littlefield, providing for giving publicity to the affairs of commercial combinations. It provides that every corporation engaged in interstate or foreign commerce shall file with the Interstate Commerce Commission on or before Sept. 1 in each year a return, giving, among other things, its name, date of organization, when and where organized, the statutes under which organized, and, if consolidated, the names of the constituent companies and the same information concerning them. If the concerns have been reorganized, the original corporation is to be explained. The return must show the amount of authorized capital stock, shares into which divided, par value, whether common or preferred, and the distinction between each, amount issued and outstanding, amount paid in—how much, if any, paid in cash and how much, if any, in property, and if paid in property a description and cash market value of the property at the time it was received in payment. The indebtedness, its nature and for what purpose incurred are to be given; also a statement of the assets at their present market values, giving the elements on which the market value is based. It is also required that total earnings and income, operating expenses, interest, taxes, permanent improvements, net earnings, dividends declared, with rate and date during the year preceding the first of the preceding July, salary of officials and wages of employees be disclosed. It is provided, further, that the treasurer or other officer of concerns affected by the bill having the requisite knowledge shall answer on oath all inquiries which may be made in writing, under the direction of the Interstate Commerce Commission, relative to its financial condition or its capital stock. Such answer is not to be used as evidence against the person making it, except in prosecutions under the proposed act. A tax of 1 per cent. a year is imposed on so much of the capital stock outstanding as is not fully paid in cash or other property at its full cash market value, and provision is made for collecting the tax. Any concern contemplated in the bill failing to make the return as required, and any concern failing to pay the tax imposed, is to be restrained on the suit of the United States from engaging in interstate or foreign commerce. It is made the duty of the Attorney General, at the request of the Interstate Commerce Commission, to enforce the provisions of the proposed act. Provision is made that the Interstate Commerce Commission shall prepare and publish a statement showing a list of corporations and their condition. The bill does not apply to any concern whose capital stock does not exceed $500,000.

## A Magnetic Traction Increaser.

Patents on a device for increasing the adhesion of wheel to rail and thereby increasing the tractive power of any motor have recently been granted to the Magnetic Equipment Co., Chicago. The inventor is A. A. Honey, at one time Superintendent of Telegraph of the Northern Pacific.

The development of the device was accomplished principally through experiments on electric cars. As applied to one of these cars the device consists of four similar parts, each applied so that a wheel of the car forms part of the magnetic circuit. Each of these parts is composed of a cast-steel arm, the upper end of which is formed into a bearing for bolting around the axle, and is retained in place by a collar secured to the axle. The lower end of this arm carries an idler wheel the size of which depends somewhat upon conditions, the smallest being 12 in. in diameter and 4 in. wide. Normally, this wheel is held by a spring a short distance above the rail. The arm has wound upon it a coil of the necessary proportions to produce the desired amount of magnetism, and the switch for controlling the circuit is placed convenient for the motorman. Closing the circuit causes the idlers to be drawn down to the rail, completing the magnetic circuit through rail and wheel.



Magnetic Traction Increaser.

For purposes of demonstration a small model of a trolley car weighing 210 lbs., equipped with two motors yielding about ⅛ h.p. under the conditions used, and also equipped with the traction device, has been set up to run on a track having at one end an incline of 45 deg. Under ordinary conditions of adhesion the car will not ascend this grade, simply standing at the foot and spinning its wheels. Upon closing the traction-device circuit the ascent is readily made.

This model was constructed with the expectation of having it give results bearing the same ratio as would be given by full-size cars. The drawbar pull exerted by it, first under normal conditions with the wheel slipping and then with the device in use and the wheels slipping, gave 32 and 105 lbs. respectively on a dynamometer, or an increase of 228 per cent. It is claimed that the full-size car gave results showing an increase of 350 per cent. The company is equipping a 40-ton, eight-wheel locomotive for experimental purposes and expects to have it ready in a short time.

The great advantage of this device on an electric car would be in starting and stopping, for it adds to the effectiveness of the brake, preventing the wheels from slipping. The latter point is of especial advantage on steep grades. There may also be a provision for throwing the motors in circuit with the device in case the current is lost on the grade, as the current generated by the motors will then operate the device and enable the car to be easily controlled.

## Foreign Railroad Notes.

In the state of Santa Catharina, in Southern Brazil, an English company obtained a guarantee of interest for the capital invested in a railroad 72 miles long from some coal mines in the interior to the ports of Imbituba and Laguna. After it was built it was discovered that the coal was not worth mining, and the company is said to work the road chiefly in order to draw the guaranteed interest, the coal for the locomotives of this "coal road"

The Swiss railroad employees have long been urging a reduction of the hours of a day's work. These, by a law passed in 1889, must not exceed twelve. The legislative bodies have now intimated that this maximum can be reduced to eleven, but only for employees on main lines. The employees on branches are up in arms at this. They say that under the existing rules they may be kept at work thirteen to fifteen hours per day, and they have held a convention and formed a special association to agitate for an improvement of their condition, which they had confidently expected when the state took charge of the railroads.

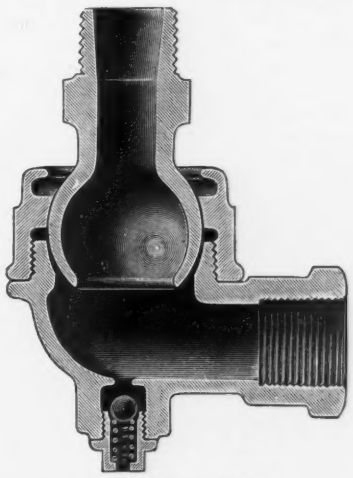
All but one of the six great railroad systems of France have a terminus in Paris, and it is not often easy to travel between important places on different systems without going to Paris—often a very indirect route. There is now a movement to compel the lines concerned to run a through train, or through cars, from Bordeaux to Clermont-Ferrand and eventually to Lyons—an east and west route through the middle of Southern France. Bordeaux is the second port of France, with 257,000 inhabitants, and Lyons is the second city, with 459,000, and directly on the route to Geneva and Switzerland, and the two cities are but about 375 miles apart; but at present the quickest way to go from one to the other is to travel nearly due north 363 miles to Paris and thence 318 miles southeast to Lyons, which is a good deal like going from Pittsburgh to Rochester by way of Philadelphia.

## The Moran Flexible Steam Joint.

Our readers have known the Moran flexible joint for a good many years, and indeed with many of them it has long been standard practice for places demanding a flexible metallic joint—a difficult thing to produce.

A strong feature of the Moran joint is the simplicity of its construction, with only three parts—ball, bell and ring, without gaskets, packing or springs to make it tight. For steam, air or pressure work of any kind it is made with a certain play between the parts, and when pressure is applied the joint becomes tight, and at the same time flexible. It has a full open way, and when it is turned to its extreme angle the passage is the full calibre of the pipe. Steam acts both as a cushion and lubricant to the ball part, which soon becomes case hardened, and instead of wearing out, it is constantly reseating itself. For steam-heating connections between engine and tender this joint has long been used with much success.

Each joint has an automatic drain or drip, as shown by the engraving, to prevent freezing, and so applied as to be perfectly free to move in any direction. Live steam, hot ashes, cinders or dirt does not affect its life.



The Moran Joint.

The Moran joint is in daily use by the following railroads: Pennsylvania, Baltimore & Ohio, Chicago & North Western, Chicago, Milwaukee & St. Paul, Southern, Northern Pacific and also the Baldwin Locomotive Works and American Locomotive Co. For air-brake connections between engine and tender it is found very useful, as any desired pressure may be carried. It is also used for high pressure connections on locomotives, air motors, etc., with satisfactory results by the H. K. Porter Co.

A modified type of this joint is used to convey fuel oil between engine and tender, for loading and unloading connections to tank-cars, oil steamers, barges, etc. The general application for railroad work includes connections to steam shovels, rapid unloaders, pile drivers, pneumatic hoists, rock drills and similar machinery used for construction purposes.

The joint is made and sold by the Moran Flexible Steam Joint Co., Louisville, Ky.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

## EDITORIAL ANNOUNCEMENTS.

*CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

*ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

On Monday of this week the first regular through train ran between Santiago and Havana over the new railroad of the Cuba Company. This work was described in our issue of Nov. 28. As we have said before, the building of this railroad is probably the most important thing that has happened in Cuba since the war. It is one of those great and daring enterprises which run ahead of the present, and change the face of countries. The courage and foresight of Sir William Van Horne and his associates open the way to peace and prosperity in Cuba even if the great investment returns no interest for some years to come, as seems probable enough.

Every daily newspaper in New York, so far as we know, is favoring the grant of the franchise for the Pennsylvania tunnel across the Island. Every city officer who has made his opinion known is also in favor of it, and so is every body of citizens that has expressed itself, except that some of the labor unions insist on a clause regulating the hours of work and the rate of wages. Reasonable suspicion has been cast on the source of this opposition. In short, public opinion is overwhelmingly in favor of what is unquestionably one of the most valuable public improvements ever devised for the city. This nobody questions, but the franchise is held up by a band of political buccaneers—men of no position in the business world and of no qualities, either intellectual or moral, which command respect—but entirely immune to decent public opinion. The matter will probably go to vote in the Board of Aldermen next Tuesday, and it is hoped that before that time a few of those who now oppose the franchise will come to their senses.

In another column is a description of a magnetic traction increaser which works by passing a magnetic flux through the rail and wheel, thereby increasing the adhesion. It will be remembered that a somewhat similar device was exhibited at the Master Mechanics' Convention in 1890, but which, instead of using a magnetic circuit, passed a low tension electric current through the rails and wheels. The model which was then shown could readily be made to mount a 40 per cent. grade, with the device in operation. In commenting upon that we said that the tests did not show that there was any direct proportion between the increased adhesion and the weight on drivers. The device was tried and failed on the Baltimore & Ohio. The same argument applies to the present case with even greater force. In the first place an electro-magnet, when working at a high degree of saturation, cannot exert a pull far in excess of 150 lbs. per sq. in. Furthermore, the magnetic flux is controlled by the minimum section of the circuit. In other words, the contact between the rail and wheel (a very small ellipse) is the limiting section, and it requires but little calculation to show that the total adhesion of a 50-ton locomotive could be increased but little through the medium of magnetic attraction. Again, in either of the above devices, some means of generating the necessary current must be carried on the engine, and even if the device were theoretically practicable, the question arises if the added weight could not be used to better advantage in increasing the boiler capacity. The point to be emphasized is that there is usually great danger in making comparisons from models, unless all the factors affecting the case are carefully analyzed and taken into consideration.

### The New York Central Terminal.

The plan brought forward by the New York Central & Hudson River Railroad for the improvement of the Grand Central Station and the approaches thereto is much more comprehensive and important than is apparent from a reading of the formal official statements made public. It will add 150 per cent. to the running tracks below 57th street; it will more than double the storage tracks in the yard; it will increase greatly the accommodations for passengers in the station; it will reduce the congestion in the streets outside of the station; it will enable the streets from 45th street to 55th street inclusive to be carried over the tracks; it will leave undisturbed the present surface of Park avenue on both sides of the track from 49th street to 56th street, and, finally, it will permit suburban trains to run down town on the track of the Rapid Transit subway.

In detail, there will be three tracks on each side of the present tracks from 57th street south. Beginning at about 57th street all of these tracks will be depressed, going under the present summit and taking out a grade of 1¼ per cent., southbound, which now exists. In the train shed these tracks will be 7½ feet below their present level. The tracks will be 10½ feet below the floor of the concourse, and passengers will reach the train level by ramps.

At 45th street carriage and wagon traffic will pass from the street directly to a large plaza, all under roof, which will be at a somewhat higher level than the concourse and, therefore, well above the tracks. Here passengers with their baggage will be discharged or taken up. As all of the present entrances will be retained on 42d street and Vanderbilt avenue, the passengers coming and going will be distributed over a very long front.

The concourse itself will be widened from the present 30 feet to 50 feet, north and south. The annex train shed will be taken away and replaced by an arched, glazed roof of about the same span as the existing train shed, and thus the whole train shed containing 18 or 20 tracks will be under one roof, making a very stately and imposing structure. The main waiting room will be extended through to Vanderbilt avenue and nearly doubled in size, and the yard room will be practically doubled. Underneath the concourse will be a spacious corridor through which people can go directly to the Rapid Transit subway trains. Baggage will be handled by endless belts, both north and south and east and west.

The storage yard will be extended east to Lexington avenue, and the running tracks below 57th street will be increased to 2½ times the present number. The great increase in yard room will cut off most of the empty car movement to and from the Mott Haven yards, which of itself is equal to a great addition to the capacity of the tunnel and viaduct approaches. The accommodations for passengers in the station will be so much increased that for some years there will be room enough to take care of the business without uncomfortable crowding.

Ultimately, the suburban service will be electrified and probably that will come before a great while, and then it is likely that some trains will continue right down to the foot of the Island on the Subway tracks, although it is easy to foresee that it may be difficult to find places to interpolate trains coming in from the suburbs. Still, a good deal of the express traffic in the Subway will be passengers destined to and from suburban points on the New York Central, and, consequently, all of the through trains need not be additional to the number that would be run on the express tracks were there no track connection.

This plan will cost something like 10 million dollars quite apart from the cost of electrifying the suburban service, but it seems pretty obvious that great additions must be made to the present facilities, and that the sooner those additions are made the better, for the territory north of the Island can be developed rapidly into one of the most thickly peopled suburban districts in the world. Of course, this plan does not interfere at all with the plan for a transfer station near Mott Haven, at which passengers coming in from the suburban lines may be delivered to the trains of the Manhattan Elevated. In fact, it is probable that both of these improvements will be carried out in due course.

Here is a plan worth waiting for. It is comprehensive and seems almost beyond criticism. It is true that it is unfortunate to have the train platforms 10½ feet below the concourse. Something over 15 million people go through the station every year. The use of the station has increased 33 per cent. in 10 years, and will, perhaps, increase in even greater ratio in the next 10 years because of the development of the region north of the Island. A good many foot-pounds of energy will be expended in a year by these 15 millions in going up and down, but they will go by inclines of gentle grade (10 per cent.) and will not know how much work they are doing. At any rate, these differences of level could not have been avoided by any plan that can be considered.

For some time it has seemed to us desirable that arrangements should be made to deliver passengers directly to the elevated lines north of the Harlem River, in order to keep part of the throng out of the station, to remove part of the trains from the approach tracks and to save some of the walking that the passengers have to do; but the plan now brought forward does not prevent the establishment of the transfer station in the neighborhood of Mott Haven, which has been under consideration for more than a year. The development of this transfer station plan involves one complication which the New York Central people cannot by themselves get rid of. To make it effectual the Manhattan Elevated must be so improved as to permit more express trains to be run and to permit these trains to be run the whole length of the Island; but such improvement of the elevated brings in interests which might cause, and probably would cause, long delay. The people of New York are not yet educated up to the point of making the fullest use of their elevated roads.

We notice in some of the daily papers an ungenerous disposition to criticize the New York Central management for not having brought forward this plan for improving the terminal earlier. Any man familiar with large affairs knows that such a plan does not originate all at once, and that it cannot be accepted all at once. It must, in the nature of things, develop slowly. It is not a complete and sudden inspiration, but it is of necessity an evolution, and such a process must be a matter of time. Furthermore, even after the plan is completed the work is not done, for it still remains to convince the minds of some of the men who must spend the money. All of this is commonplace, but it might not be amiss for the editors to stop and think about it.

### The Law Makers and the Railroads.

If we may believe the statements of the reporters, the commerce committees of both houses of Congress are going to take up the Elkins bill once more, and see if Congress cannot be inspired with the necessary enthusiasm—and provided with the necessary instruction—to do something in the way of enlarging the powers of the Interstate Commerce Commission. Whether the discussion will be resumed where it was broken off last spring, or will traverse again the ground already covered does not appear. Neither is it apparent how much real interest exists as a basis for the present signs of activity. The Western men who claimed to represent the flour millers of St. Louis and elsewhere and one or two other secretaries are the only men whose activity is visible to the public, and the announcements from Washington are so unobtrusive that it is impossible to see whether or not the present interest is genuine. If it were all manufactured to order, it would not look at all different from that which we see.

"The amended Elkins bill" is said to be the thing that the merchants' representatives desire to have go through; but just how much or in what way that bill has been amended does not appear. Perhaps it does not matter very much, for nothing will be done until after much discussion in committee; and the first moves in that discussion will be attacks on the most radical elements in the bill. There was an attempt in the last Congress to modify Mr. Elkins' bill by putting into it some of the features of the Nelson-Corliss measure, but the efforts seem to have been wholly without result. Indeed this difficulty of agreeing, even on single features, to say nothing of the whole elaborate proposition, would appear to indicate a poor prospect of success. If it does so indicate, it only repeats or continues what was quite apparent a year ago. Now, as then, the great majority of people are unable to form clear ideas of

what Congress ought to do, because the alleged issues are so indistinctly defined. Last winter, people who were disposed to have decided opinions concerning the problem of governmental regulation were aided by Mr. Walker D. Hines in making them decided against action by Congress. Mr. Hines is now as quiet as a dove; but if there should be any stir in Congress we should probably have to look for him, not in the hayloft windows, but on the ground floor; and in the guise of a bull-dog rather than a bird.

He and those who share his views will oppose the main proposition—that to give the Commission power to prescribe rates for one year. The assent of the Pennsylvania Railroad to that proposition which was (apparently) given last winter seems to lack enthusiasm. So far as can be seen at present, therefore, the course of affairs in Congress seems likely to be about what it was last year—successive deadlocks in an unending series.

Next week the long pending injunction cases come up in the United States Court at Chicago before Judge Grosscup; and if the issues are actually discussed, and not postponed, we shall probably get from that source much more real information about the general "railroad problem" than from anything that will be said in Congress. Under the injunctions—for months past in force by virtue of temporary orders, and now to be either dissolved or made permanent—rate cutting, between the Missouri River and the Atlantic Ocean, has been greatly abated. The discounts to large grain and meat shippers were first changed from secret to public and then were mostly abolished—abolished in the sense that small shippers got most of the privileges that were granted to large ones. Such discriminations as those made by paying high mileage on shippers' cars, still continue, and many others of less importance remain; but from the standpoint of the lawmakers the rate-situation has been made immensely better; made as good, perhaps, as any law ever can make it.

But this improved condition has been produced—so far as the legislature or the courts have had anything to do with it—by "government by injunction," and if any large railroad interest feels like opposing the continuance of the injunctions it will have a very interesting if not a powerful argument in the claim that it is deprived of important rights without the benefit of a trial by jury. Thus far the railroads and everybody appear to have been willing to let things drift; but that solution of the question cannot last forever, and the fundamental questions of rate regulation must come up for discussion again some time. We do not say that discussion must settle them; for they may be settled (as far as settlement is possible) by the forces of commerce and the lapse of time, as other commercial questions have been settled. But the questions of making secret contracts with big shippers and then issuing reduced tariffs; of giving your friend low rates on local traffic to get his long-distance business away from your competitor; these and other troubles of the past will be pretty sure to come up again when business falls off, if not before; so that the lawyers need have no fear that they will be thrown out of business.

A third point of interest in the traffic field is the hearing to be held at the office of the Interstate Commerce Commission at Washington next week to see whether the railroads can justify certain advances in rates that have been announced. If the latest press despatches are correct, some or all of these advances have been postponed until January 1. This means that large contracts at the existing rates are yet unexpired; and it may mean that some soliciting agents are hoping to make new ones and thus put the advance in rates still farther into the future—though it is to be hoped that "community of interest" and the abundance of business now offering have put an end to this foolishness. But the hearing ought to bring out some useful bits of evidence, especially if the questioners and the witnesses are in the vivacious mood that characterized the last Chicago hearings.

## October Accidents.

We publish in another column of this issue a condensed record of the principal train accidents which occurred in the United States in the month of October. The record contains accounts of 46 collisions, 30 derailments, and 6 other accidents. Those which were most serious, or are of special interest by reason of their causes or attending circumstances occurred as follows:

| | |
|---|---|
| 4th, Park City, Mont. | 12th, Barree, Pa. |
| 6th, Ardmore, Ind. T. | 15th, Reelsville, Ind. |
| 7th, Galva, Ill. | 17th, Goshen, Cal. |
| †8th, Menlo Park, N. J. | †20th, Lewis, Texas. |
| †9th, Sandy Hook, Conn. | 23d, Oneida, Tenn. |

In this list of 10 collisions and derailments will be found an unusually varied assortment of causes and attending consequences; though the total number of passengers killed is only five. It will be seen that four of the accidents are disastrous butting collisions; and in the full list the reader will find a half dozen others, all of them due to mistakes in issuing, delivering or understanding telegraphic orders. The collision at Menlo Park was one of the most prominent collisions in this record. It attracted notice by reason of its nearness to New York, where a swarm of reporters could get the details, and by the similarity, in some of its circumstances, to another rear collision which was made prominent in the New York papers not long ago. In the present case the engineman was a man of long experience and had a good record. The accepted explanation appears to be that he simply neglected to see the distant signal by which he should have taken warning that the home signal, 1,800 ft. behind the standing train, was against him. Nothing is said about the fireman's compliance or non-compliance with the rule requiring firemen to see all such signals and call out their indications to the engineman. With signals every mile, and oftener, throughout the run, and every signal on a bridge immediately above the track, a lapse like this seems almost incredible, and such a report sets some people to speculating concerning the rule permitting trains to proceed under control past an automatic block signal which is standing in the "stop" position. That rule permits enginemen to exercise discretion as to what speed limit shall be observed at the several signals, as does any "under-control" rule; and when enginemen are free to pass a horizontal home signal at a given speed, they are likely to look upon the permission to do this as a modification of the speed rule, and thus feel free to pass a horizontal distant signal at a higher speed than would be allowable if the rule to prepare to stop at the home signal were rigidly adhered to.

With the "under-control" rule slow freight trains can be run, at all times, less than a block section apart; but when passenger trains are allowed to take the benefit of this relaxed rule it becomes necessary for the trainmaster to exercise extreme care; for a slight error in judgment, on the part of the engineman, as to the distance in which he can stop his train, may result in a collision. We have heard of a railroad, in the same State as Menlo Park, where fast passenger trains are started out one minute apart, apparently with the approval of the trainmaster. With block sections one mile long, and the distant signals placed on the same posts with the home signals, it is necessary, if enginemen are to get clear distant signals, that trains be kept two miles apart (plus the distance which the runner needs to get a good view of the signal, say 1,000 ft.) Now, a two mile interval, at 60 miles an hour, means two minutes, and trains started at one-minute intervals must be run under control for several miles, each train running slower than the one preceding it, until the one minute is lengthened to two minutes; and the trainmaster who has had experience in running trains under this system needs not to be told that very particular care will be necessary to make sure that the enginemen invariably carry out the rule. If block sections are less than a mile long, and the speed is more than a mile a minute, the one-minute interval becomes, theoretically, more nearly practicable, in proportion to the increase in speed and the decrease in length of sections; but the higher the speed the greater must be the margin allowed for errors; and the speed cannot go far above 60 miles an hour before we find that our distant signals need to be put farther back. Consideration of these delicate questions, which are involved in the problem of running at high speed under control, force one to the conclusion that enginemen who are to run trains under such a system need not only to have all the good qualities of enginemen as usually understood, but also to be familiar with those important facts of speeds, brake power and the influence of grades which are taught by the air-brake expert.

The number of electric car accidents reported in the newspapers for October was 18, in which one person was killed and 93 were injured. Three of the collisions were between electric passenger cars and electric freight cars. One of the derailments, in which 22 persons were reported injured, was caused by running into an automobile which it is said was recklessly run upon the track in front of the street car.

"The Present Position of the Question of Alarm Signals" is the title of a note contributed to the last issue of the *Bulletin* of the International Railway Congress (page 911) by the Secretary of the Congress, Mr. L. Weissenbruch. By "alarm" signals Mr. Weissenbruch refers to audible or other signals used to warn a locomotive runner when he overruns or is about to overrun a danger signal; and he thinks well enough of the scheme of providing additional landmarks, to facilitate the "finding" of visual signals, to show with his note a drawing of an arrangement for fences or boards to be fixed along the line approaching a signal. This scheme, as the reader will recollect, was recommended in the *Railroad Gazette* a few months ago (July 11, page 554). Mr. Weissenbruch's drawing shows a section of fence 10 meters (33 ft.) long, beginning 130 meters (426 ft.) before the semaphore is reached. After an interval of 20 meters there is another fence of the same length, a little higher; in both of these the upper longitudinal member is horizontal. After another interval of 20 meters comes a third 10 meter fence; in this the longitudinal member slants upward; then, after another similar interval, there is a similar fence, slanting upward at a greater angle. Then there is a space of 30 meters from this last fence to the signal. It is suggested that the boards might be coated with a white phosphorescent paste, so as to make them visible in the night. The résumé of the general question affords little that is striking. It is stated that the "crocodile," the electric contact apparatus in use on the Northern of France for conveying a signal to a locomotive by means of a metallic fixture placed on the ties between the rails, is in extensive use, about $200,000 having been expended for this class of signals. The Eastern of France has made experiments with a mechanical device in the same line, but apparently with very indifferent success. Mr. Raven's mechanical appliance, for sounding a whistle on a locomotive, which was described in the *Railroad Gazette* of March 8, 1901, is spoken of as having been "unexpectedly" introduced on the North Eastern of England. The officers of that road, in expressing their satisfaction with Raven's apparatus, say that it "makes it possible to abolish fogmen"; but we do not learn whether the fogmen have been actually abolished, and there is no information as to how the Board of Trade looks at the innovation. English fogmen not only put torpedoes on the rails, but give positive go-ahead signals, by hand, to the runners. This, as Mr. Weissenbruch rightly observes, is an important function which audible signals have never yet been made to perform. He thinks that with an audible signal giving the all clear indication—which indication it is necessary to give, if the signal is to conform to correct principles—the constant noise would be intolerable. Hence, he thinks that the only way we can use audible signals is by treating them as auxiliaries, and this use he thinks is well worth while. After this discussion of audible signals, he proceeds to the discussion of the other plan which was mentioned at the beginning of this note. The theory of this plan—radically different from that of the auxiliary signal—is to increase the value of the visual signal, by increasing the certainty that it can be seen. With this theory consistently carried out, an audible signal is useful only when the engineman is heedless; and an engineman who fails to stop at a signal, and tries to excuse himself by claiming that he had difficulty in finding the signal, comes pretty near convicting himself by his own admission.

Mr. J. D. Hawks, President of the Detroit & Mackinac, lately said to a reporter: "Western roads are spending millions in building extra tracks and new sidings to take care of the increasing traffic, but this only congests it more at seaboard points. Take New York traffic, for instance; the New York Central does not own a foot of land more than it did 20 years ago. There are vessels to handle the goods all right, but they cannot get loaded. The increasing facilities in the west and northwest have enabled the roads to clear up their own lines, but it is in the east that the congestion starts and like a stream of water that is flooded, backs up all streams flowing into it. New York gets its side tracks full, then the cars have to be sidetracked somewhere further out and so it goes on extending back westward. Buffalo is to a certain extent a terminal point; the situation there is much the same as in New York, Jersey City and Weehawken. Had the eastern roads ample seaboard terminals to take care of the business, you will find that the motive power would be sufficient to keep it moving, and there would not be thousands of cars acting as warehouses on sidetracks, earning nothing for the roads but kicks from shippers and consignees." This general line of thought has been pretty familiar to some railroad men for several years. It is not a question of New York or of Buffalo or of Pittsburgh or of Chicago. The thought applies to terminals all over the country; it is merely a matter of degree. Business has outgrown the yards and the terminal facilities.

## NEW PUBLICATIONS.

*The Scientific American—Transportation Number.*—*The Scientific American* for December 13 is a general transportation number. It contains 38 pages, with many illustrations. The main divisions are marine transportation, lake transportation, railroad transportation and electric traction. Interesting and useful general descriptions appear of various notable and typical ships, and the railroad division contains an account of a ride to Chicago and back on the locomotive of the "20th century limited," some notes on the history of the American locomotive, by Mr. Walker; some statistics of the railroads of the United States, and an article on railroad signals by Mr. Adams. There are a number of interesting pictures of early locomotives, and others showing recent development.

## TRADE CATALOGUES.

*The Westinghouse Machine Company* has issued a small folder giving the names of recent purchasers of Roney mechanical stokers together with the total horsepower installed by each. A summary of this list is as follows:

| | Horse-power. |
|---|---|
| Electric railroads | 178,250 |
| Electric lighting companies | 78,880 |
| Steel and iron works | 97,450 |
| Railroad shops and stations | 25,025 |
| All others | 127,075 |
| Total | 506,680 |

## Train Accidents in the United States in October.[1]

unx, 2d, St. Louis, Iron Mountain & Southern, Van Buren, Ark., a freight train was derailed and a brakeman was killed.

bc, 3d, Vandalia Line, Brazil, Ind., butting collision of freight trains, wrecking two of the three engines. A fireman was killed and one engineman and two other trainmen were injured, the engineman fatally. It is said that a telegraphic order was misinterpreted by the eastbound train.

xc, 3d, 3 a.m., Boston & Maine, East Deerfield, Mass., collision between a passenger train and a switching engine; one engineman and one fireman were killed and two other trainmen were injured, one of them fatally.

xc, 3d, Philadelphia, Wilmington & Baltimore, Washington, D. C., collision of freight trains; one engineman and one fireman killed.

unf, 3d, Southern Pacific, Sandy Fork, Texas, a passenger train was derailed at a washout, and the engine and the first three cars were wrecked. Three trainmen were injured.

unf, 3d, Great Northern, Lakota, N. Dak., a freight train was derailed by running over a horse and the engine and 18 cars were wrecked. A brakeman was killed.

unx, 3d, St. Louis Southwestern, Waco, Texas, a freight train was derailed and 14 cars were ditched.

unx, 4th, St. Louis Southwestern, Waco, Texas, an engine going to the wreck described in the preceding paragraph was derailed and overturned, and a fireman was fatally injured.

xc, 4th, 2 a.m., Pennsylvania Railroad, Milton, Pa., a passenger train running at high speed collided with five cars of a freight train being switched on the main track, wrecking the engine and several freight cars. The engineman of the passenger train and the conductor of the freight train were killed, and the passenger fireman was badly injured. The freight train was using the main track on the time of the passenger train, and the flagman failed to properly signal the passenger train.

rc, 4th, 2 p.m., Southern Pacific, Dixon, Cal., Overland Limited, train No. 5, ran into the rear of a freight train entering a side track. A passenger riding on the engineer's seat was instantly killed, and the engineer was hurt about the face and head. The engine was badly damaged.

*bc, 4th, Northern Pacific, Park City, Mont., butting collision between an eastbound passenger train of the Northern Pacific and a westbound passenger train of the Burlington road, wrecking the engines and mail cars. The wreck took fire and most of it was burnt up. Two trainmen were killed and several passengers and employees were injured.

xc, 4th, 11 p.m., Louisville & Nashville, New Castle, Ala., a freight train, about to stop at a station, broke in two, and the rear portion afterward ran into the forward one wrecking several cars. A car containing turpentine exploded, and the wreck was mostly burnt up.

5th, Butler, Pa., a freight train of the Pennsylvania road collided with a freight of the Buffalo, Rochester & Pittsburgh at the intersection of the two roads, and the Pennsylvania engine was overturned and eight cars were wrecked. A crossing flagman was injured.

dn, 5th, 9 p.m., Southern Pacific, Morgan City, La., a freight train was derailed at the draw bridge over the Berwick Bay, the bridge being not exactly in place, and five freight cars and a part of the draw fell to the bottom of the bay.

dn, 6th, New York Central & Hudson River, Hoffman's, N. Y., a car in an eastbound freight train was derailed at a misplaced switch and fell on the westbound track, striking the engine of a passenger train. The passenger engineman jumped or fell off and was killed.

bc, 6th, Norfolk & Western, Walnut Cove, N. C., collision between a passenger train and a freight; the passenger engineman was fatally injured.

bc, 6th, 5 a.m., Gulf, Colorado & Santa Fe, Ardmore, Ind. T., butting collision of freight trains, wrecking both engines and many cars. One engineman and one fireman were killed, and five other trainmen were injured. It is said that the southbound train, having orders to meet three northbound freights, mistook a dead engine for the third train, and consequently started out on the time of the third northbound train.

dr, 6th, St. Louis Southwestern, Sulphur Springs, Texas, a freight train was derailed and 17 cars were wrecked. A brakeman was killed.

unx, 6th, Missouri, Kansas & Texas, Wagoner, Ind. T., a passenger train was derailed at a frog and the engine was overturned. The engineman and fireman were badly injured.

unx, 6th, St. Louis Southwestern, Winfield, Texas, a passenger train was derailed and the engineman and fireman were injured.

o, 6th, Baltimore & Ohio, New Martinsville, W. Va., the locomotive of a freight train was wrecked by the explosion of its boiler, and three trainmen were injured.

rc, 7th, Pennsylvania road, Mifflin, Pa., a freight train ran into the rear of a preceding freight and several cars were wrecked. A brakeman was killed and five other trainmen were injured.

dr, 7th, Buffalo, Attica & Arcade, Arcade, N. Y., a gravel train was derailed and the engine and several cars fell down a bank. The fireman was killed and the engineman injured. It is said that the derailment was due to the failure of a temporary bridge.

xc, 7th, Pittsburgh, Cincinnati, Chicago & St. Louis, Van Emmans, Pa., a freight train ran into a gravel train which was being moved from a siding to the main track, and the freight engine and many cars were wrecked. Four employees were killed.

eq, 7th, Yazoo & Mississippi Valley, Vicksburg, Miss., a freight train was derailed by a broken axle and several cars were wrecked. Two unknown men were killed.

unf, 7th, 11 p.m., Chicago, Burlington & Quincy, Galva, Ill., an eastbound mail train running at high speed was derailed by a coal gate which had fallen from the tender of an engine passing on the westbound track and had lodged on the eastbound track. The fireman was killed and the engineman fatally injured.

unx, 7th, 11 p.m., Arkansas Southern, Jonesboro, La., a passenger train was derailed and the engineman and fireman were injured, the fireman fatally.

†rc, 8th, 9:30 a.m., Pennsylvania Railroad, Menlo Park, N. J., eastbound passenger train No. 6, which had been stopped for the purpose of cooling a hot journal, was run into at the rear by passenger train No. 76, and one passenger (an employee of the road) was killed and 10 or 15 passengers and two trainmen were injured. The rear car of the standing train was a mail car, and this was partially wrecked, although it is said that the speed of the following train was not great at the moment it struck. The passenger who was killed was in the fifth car from the rear, the front of that car being crushed, while the two next behind it were uninjured. The entrance to the automatic block-signal section in which train No. 6 was standing is 1,800 ft. back of the point at which the collision occurred, and the distant signal for this section is 2,200 ft. farther back. The grade of the line descends eastward at this point about 27 ft. to the mile, and there is a curve in the line. Train No. 76 is scheduled at two hours from Philadelphia to Jersey City, 90 miles, with five stops; so that it always runs at high speed; and it would appear that in this case the engineman did not take prompt measures to reduce his speed after passing a distant signal which was standing against him. The weather was clear.

bc, 8th, Chicago, Peoria & St. Louis, Manito, Ill., butting collision of freight trains; two trainmen badly injured.

eq, 8th, 4 a.m., Baltimore & Ohio, Suterville, Pa., a freight train was derailed by a broken axle and 18 loaded cars were ditched. A wrecking train sent to the relief of the freight collided with the rear end of the latter.

dn, 8th, Illinois Central, Webster City, Iowa, passenger train No. 4 was derailed at a derailing switch and the engine and first two cars were overturned. The conductor and fireman were injured.

†bc, 9th, New York, New Haven & Hartford, Sandy Hook, Conn., butting collision between a regular and a special passenger train, badly damaging the first car of the special train, which was loaded with excursionists. One passenger was killed and about 20 were injured. The special train was wrongfully running on the time of the regular passenger train, the engineman having forgotten an order.

rc, 10th, Cleveland, Cincinnati, Chicago & St. Louis, Terre Haute, Ind., rear collision of freight trains on the bridge over the Wabash River, damaging the engine and several cars. Two men were killed and six were injured; and the body of an unknown man fell into the river and was lost.

bc, 11th, 11 p.m., Southern Pacific, Lakeview, Cal., butting collision of freight trains; one engineman killed and one fireman injured. The engineman who was killed had run past the point at which he should have met the other train, and it is conjectured that he made a mistake in counting the tunnels which he had gone through. Thinking he had passed only five when he had passed six, he failed to properly locate the meeting station.

unf, 11th, Southern Railway, Brompton, Ala., a freight train was derailed by a rock which had fallen upon the track and the engine and six cars were wrecked. The fireman and a tramp were killed.

*12th, 2 a.m., Pennsylvania road, Barree, Pa., 14 cars of coal in an eastbound freight train were derailed, apparently by the sudden stoppage due to the breaking of the train into two parts, and a part of the wreck fell upon the adjacent track. A passenger train on this track running at high speed, in the same direction as the freight train, ran into the wreck, and the engine and several cars of the passenger train were added to it. The passenger engine was overturned and fell down a bank. The engineman of the passenger and a brakeman of the freight were killed and the fireman of the passenger was fatally injured. Several passengers and four mail clerks were also injured. The wreck took fire and several cars of coal were burnt up.

13th, Chicago, Burlington & Quincy, Seward, Neb., butting collision of freight trains, overturning both engines and wrecking several cars. Several head of cattle were killed. The collision was due to the neglect of the operator at Seward to deliver an order to the eastbound train.

xc, 14th, Philadelphia & Reading, Philadelphia, Pa., a train of empty passenger cars collided with some empty freight cars on a side track, and a woman walking near the side track was killed.

xc, 14th, Chicago & North Western, Chicago, Ill., collision of freight trains due to a misplaced switch; one employee killed and two injured.

bc, 15th, Chicago & North Western, Norwalk, Wis., butting collision of freight trains, wrecking both engines. One fireman was killed.

bc, 15th, Vandalia Line, Reelsville, Ind., butting collision of passenger trains, badly damaging both engines and several cars. A mail clerk was killed and five trainmen and a trespasser were injured.

xc, 15th, Missouri, Kansas & Texas, Denison, Texas, six empty passenger cars which escaped control while being switched ran unattended north three miles to Warner, where they ran into the rear of a freight train standing at a water tank. The caboose was wrecked, and a drover who was in it was injured.

bc, 16th, Northern Central, Pine Valley, N. Y., butting collision between a freight train and an empty engine, badly damaging both engines. Three trainmen were injured. It is said that the engineman of the empty engine forgot about the freight train.

bc, 17th, Chicago, Burlington & Quincy, St. Joseph, Mo., butting collision between a northbound passenger and a southbound freight train, badly damaging both engines and several freight cars. Four passengers were injured. It is said that an operator neglected to deliver an order to the passenger train.

dr, 17th, 5 a.m., Southern Pacific, Goshen, Cal., a freight train was derailed by a broken rail and 14 cars were ditched and wrecked. A number of 13,000 gallon oil tanks were ruptured, and a lake of oil was formed on each side of the track. Five tramps riding on the cars were killed, one of them being drowned in the oil.

dn, 17th, Southern Railway, Jackson, Ky., a passenger train was derailed at a switch which was not properly closed, and the rear car fell down a bank and was overturned. Nine passengers and the conductor were injured.

bc, 18th, Southern Pacific, Beaumont, Texas, butting collision between an empty engine and a freight train. The empty engine, having been reversed and deserted, ran back, after the collision, to a yard, and collided with a switching engine, badly damaging both engines.

xc, 18th, Southern California, Los Angeles, Cal., collision between a freight train and a switching engine, wrecking both locomotives and a dozen cars. Three trainmen were injured. There was a dense fog at the time.

bc, 19th, North Shore, Howard's, Cal., a freight train which had been stopped between stations, was run into at the front by a work train, and both engines were badly damaged. Two trainmen were injured.

bc, 19th, Northern Pacific, Baxter, Minn., butting collision between a passenger train and an empty engine; one passenger injured.

xc, 19th, Seaboard Air Line, Rockingham, N. C., passenger train No. 33 ran over a misplaced switch and into a freight engine standing on a side track, making a bad wreck. A brakeman of the freight was killed, and three trainmen were injured. The standing engine was pushed forward into another engine, doing further damage.

†xc, 19th, Southern Pacific, Exeter, Cal., collision between two excursion trains on a Y track, wrecking a caboose. A passenger in the caboose was killed.

bc, 20th, Southern Railway, Coal Creek, Tenn., butting collision between a passenger train and a freight, badly damaging both engines and three cars. Three trainmen and 12 passengers were injured. An order which had been delivered to the freight train was overlooked.

†xc, 20th, International & Great Northern, Lewis, Texas, freight train No. 64 collided with passenger train No. 101 at a crossing, overturning one passenger car. Three passengers were killed and 15 were injured.

eq, 20th, Philadelphia & Reading, Palmyra, Pa., a freight train was derailed by the breaking of the flange of a wheel, and many cars were wrecked. Three tramps were killed.

dn, 20th, Cleveland, Cincinnati, Chicago & St. Louis, Flint, Ohio, a passenger train was derailed at a misplaced switch and the engineman and two other trainmen were injured, the engineman fatally. Five passengers were slightly injured.

dn, 20th, Northern Central, Lyken's, Pa., a gravel train became uncontrollable on a descending grade and was derailed and wrecked. Two employees were killed.

xc, 21st, St. Louis Southwestern, Bossier City, La., a freight train descending a grade broke in two and the rear portion afterward ran into the forward one, damaging five cars. A tramp was killed.

21st, Cincinnati, Hamilton & Dayton, Elmwood, Ohio, a passenger train was derailed at a misplaced switch and one car was wrecked. Several passengers were injured.

21st, Cleveland, Cincinnati, Chicago & St. Louis, Parker, Ill., a passenger train consisting of an engine and three cars broke through a trestle bridge which had been weakened by fire. The engine and baggage car fell to the ravine below and the two passenger cars fell down a bank and were overturned. Three trainmen and four passengers were slightly injured.

eq, 21st, 8 p.m., New York, Ontario & Western, Preston Park, Pa., a freight train was derailed by a broken wheel and a number of cars fell off a trestle bridge, making a bad wreck. A brakeman was killed.

21st, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn., a car in a passenger train was derailed by one of its trucks being diverted at a switch, and an employee standing on the ground near by was fatally injured.

o, 21st, Southern Pacific, Surf, Cal., the locomotive of a freight train was wrecked by the explosion of its boiler and three trainmen were injured.

bc, 22d, St. Louis, Iron Mountain & Southern, De Soto, Mo., butting collision of freight trains; five trainmen injured.

xc, 22d, 5 a.m., Pennsylvania road, New Florence, Pa., an eastbound freight train ran into the rear of a preceding freight, wrecking several cars. The wreck fouled the westbound track and a passenger train ran into it, damaging several cars in the latter train. The fireman of the passenger train was killed and the engineman injured. There was a dense fog at the time.

*rc, 23d, 11 p.m., Cincinnati, New Orleans & Texas Pacific, Oneida, Tenn., a freight train drawn by two engines ran into the rear of a preceding freight, damaging caboose and several cars. The wreck took fire and six cars, together with two houses near by, were burnt up. Both the engineman and fireman of the colliding engine had fallen asleep. The superintendent states that they had been on duty but five hours, and had had sufficient rest.

24th, Choctaw, Oklahoma & Gulf, Little Rock, Ark., rear collision of freight trains, wrecking the caboose and four cars; two trainmen killed.

o, 25th, Chicago & Alton, Evanston, Mo., the locomotive of a freight train was wrecked by the explosion of its boiler and 17 cars were derailed. The fireman was killed and two other trainmen were injured.

bc, 26th, Northern Pacific, Hope, Idaho, butting collision between a westbound freight train, drawn by two engines, and an empty engine eastbound, wrecking all of the engines and several cars. Two trainmen were injured.

bc, 27th, Southern Pacific, Campbell, Cal., butting collision between a mixed train and an empty engine, wrecking both engines. One engineman was killed and one fireman injured. There was a dense fog at the time.

dn, 27th, Cleveland, Cincinnati, Chicago & St. Louis, Terre Haute, Ind., passenger train No. 8 was derailed on the bridge over the Wabash River at a point where rails had been removed in the course of repairing the track, and the engine and several cars ran some distance on the sleepers. The fireman jumped off and was injured.

unf, 27th, 1 a.m., Yazoo & Mississippi Valley, Baton Rouge, La., a passenger train was derailed by running over a cow and several cars were ditched. The engineman and a tramp were killed and the fireman was fatally injured.

o, 27th, St. Louis & San Francisco, Oklahoma City, Okla. T., the locomotive of a freight train was wrecked by the explosion of its boiler, and three trainmen were injured.

*rc, 28th, 1 a.m., Missouri, Kansas & Texas, Canadian, Ind. T., a freight train ran into the rear of a preceding freight, wrecking several cars. Nine loaded cars took fire and were burnt up. A drover and two trainmen were injured.

*xc, 28th, Chicago, Milwaukee & St. Paul, Minneapolis, Minn., collision between a work train and a switching freight, wrecking one engine and several cars. Five freight cars took fire and were burnt up.

unf, 28th, Norfolk & Western, Marion, Va., a passenger train was derailed by a rock which had fallen on the track, and the engine and express car were wrecked. The fireman was injured.

o, 28th, Southern Pacific, La Porte, Texas, some bales of cotton on a platform car in a freight train took fire, from a prairie fire adjoining the track, and all of the cars in the train, except one, were burnt up.

*rc, 29th, 7 p.m., Pennsylvania road, Dillerville, Pa., a passenger train ran into the rear of a preceding freight, wrecking the engine and three cars. The engineman and fireman were injured. The wreck took fire and was mostly burnt up.

bc, 29th, Norfolk & Western, Bristol, Tenn., butting collision between a freight train and a work train; both engines and several cars were wrecked. The fireman and several other employees were injured. It is said that

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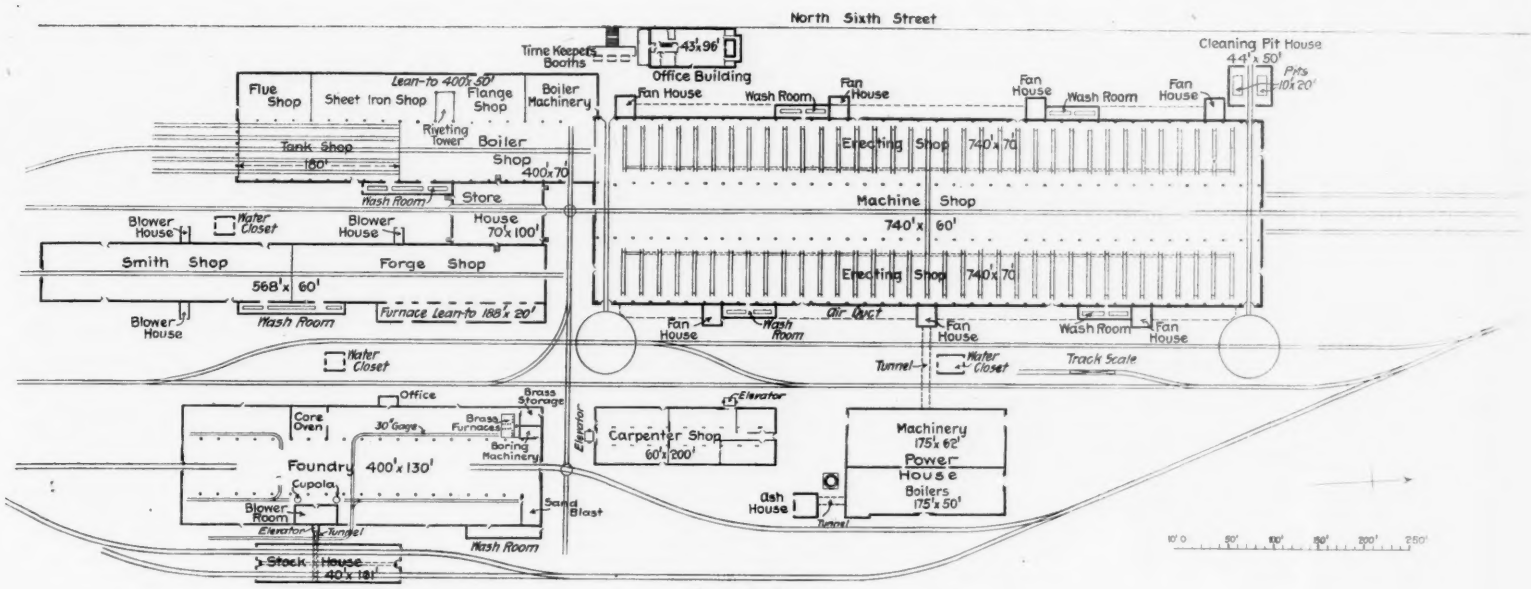
[1]Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The tabular record of totals is no longer kept, as a more complete report of the total number of accidents is published by the Interstate Commerce Commission. The classification of the accidents is indicated by the use of the following

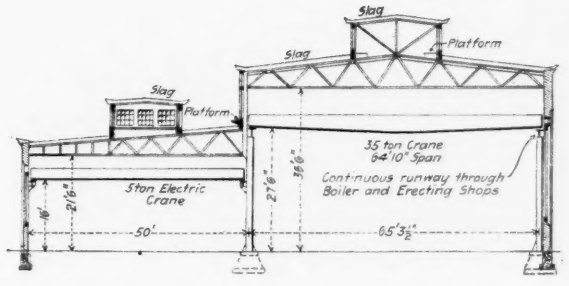
ABBREVIATIONS.

| | |
|---|---|
| rc | Rear collisions. |
| bc | Butting collisions. |
| xc | Miscellaneous collisions. |
| dr | Derailments; defect of roadway. |
| eq | Derailments; defect of equipment. |
| dn | Derailments; negligence in operating. |
| unf | Derailments; unforeseen obstruction. |
| unx | Derailments; unexplained. |
| o | Miscellaneous accidents. |

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.




General Layout.

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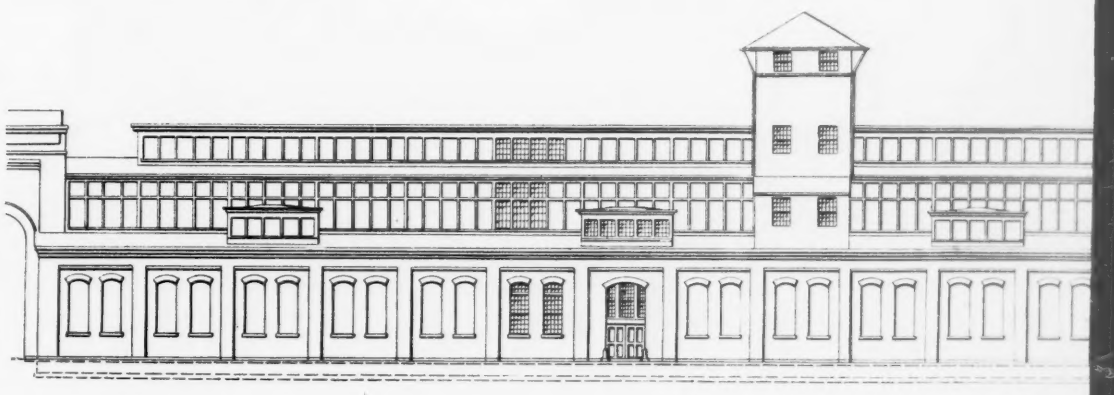
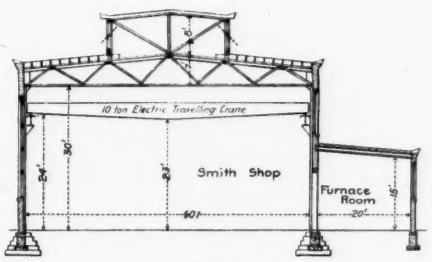


West Elevation.

Boiler Shop.

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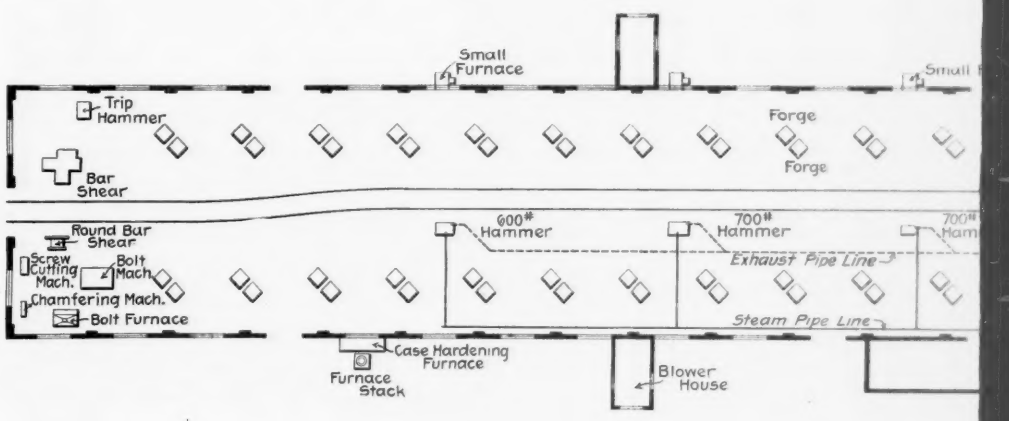
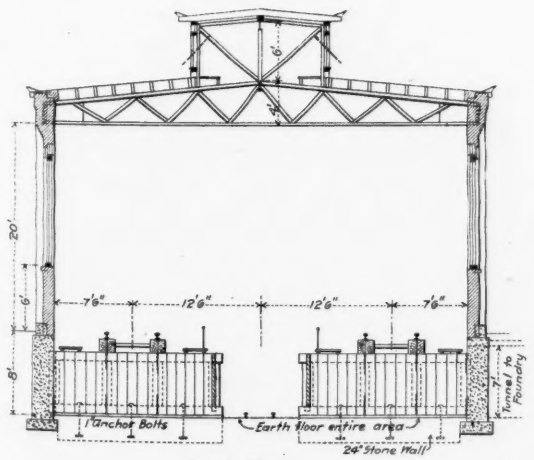
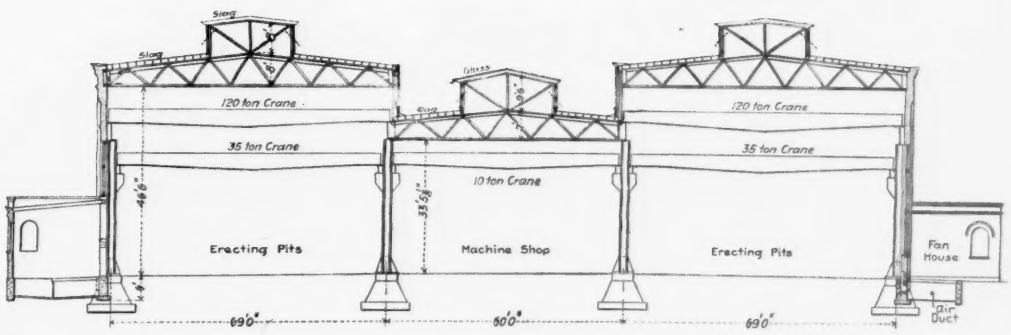


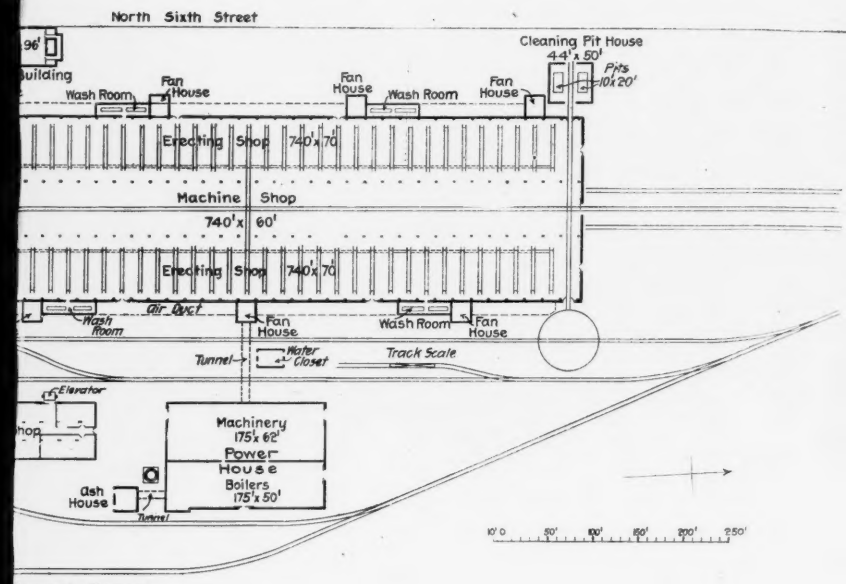

Smith and Forge



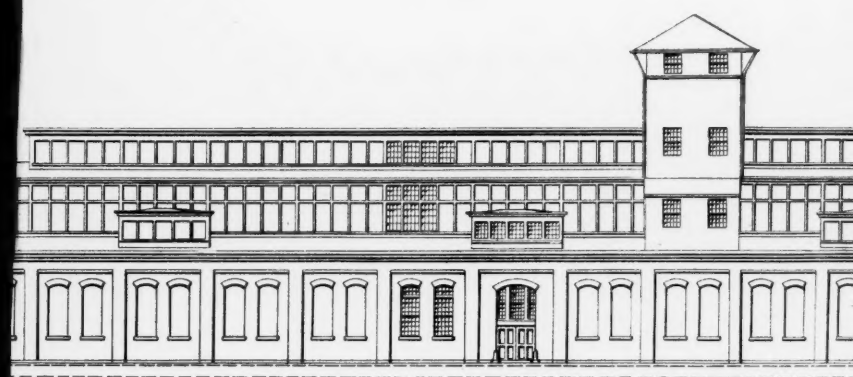

Stock House.




Main Locomotive Shop.

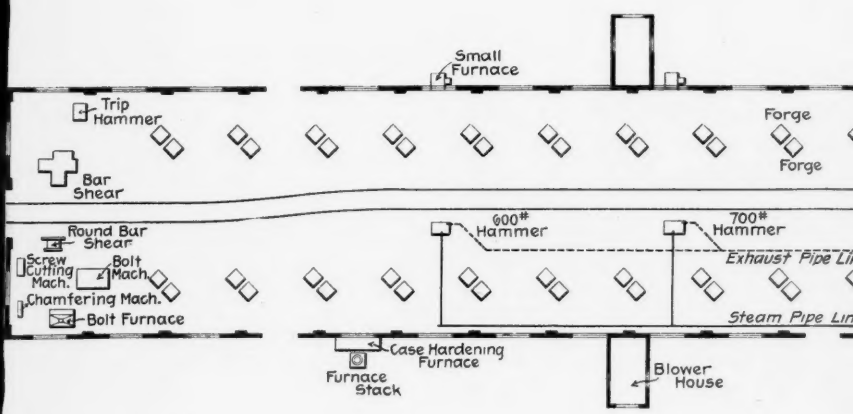



**General Layout.**

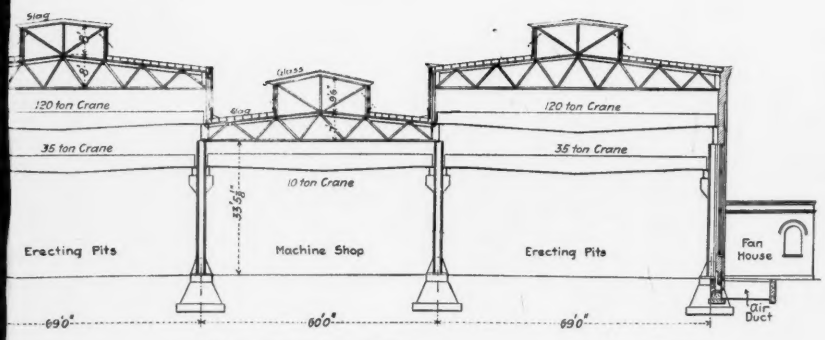


*West Elevation.*

**Boiler Shop.**

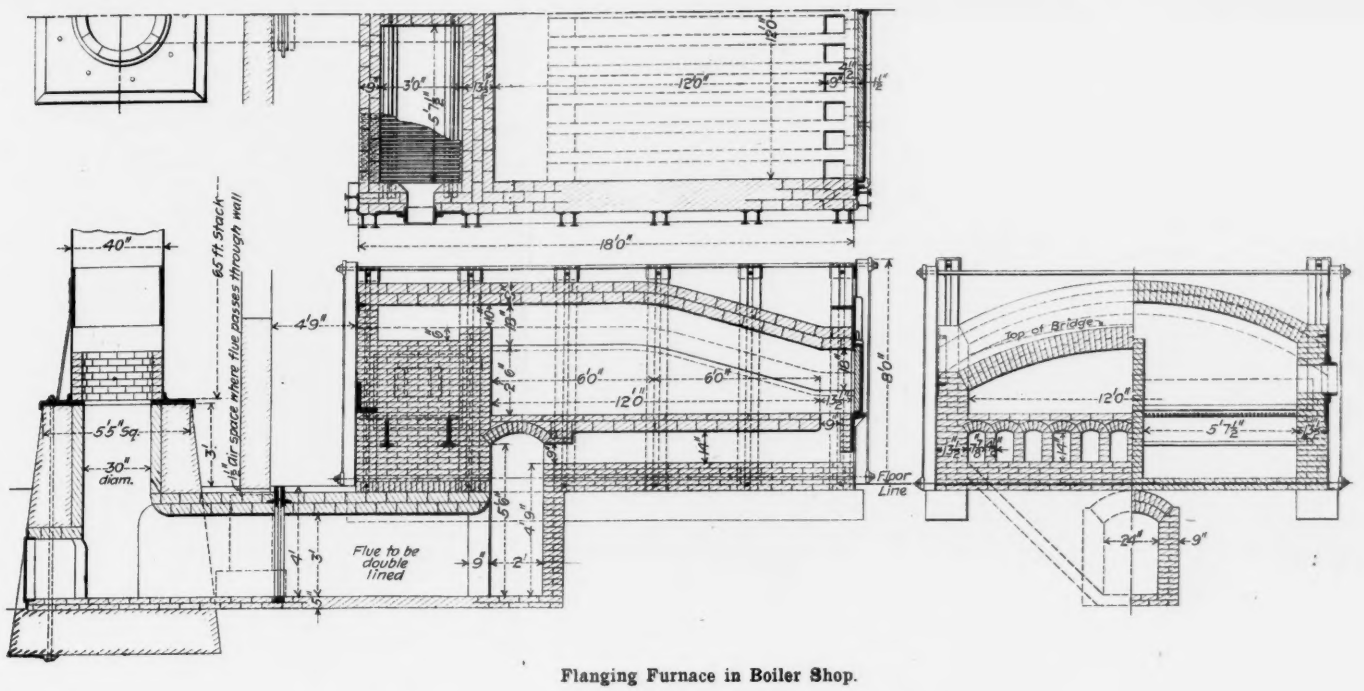



Smith

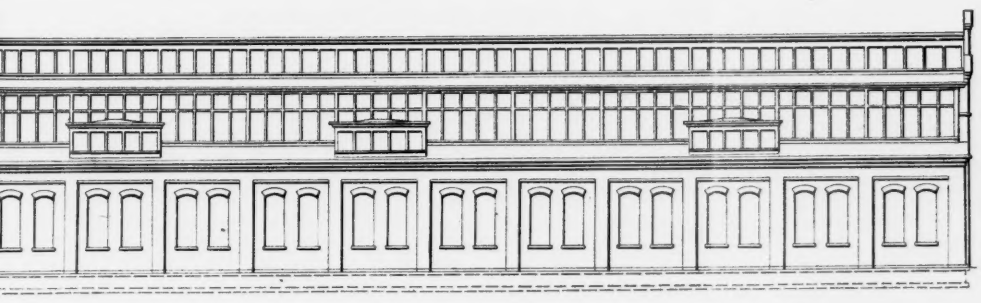



**Main Locomotive Shop.**

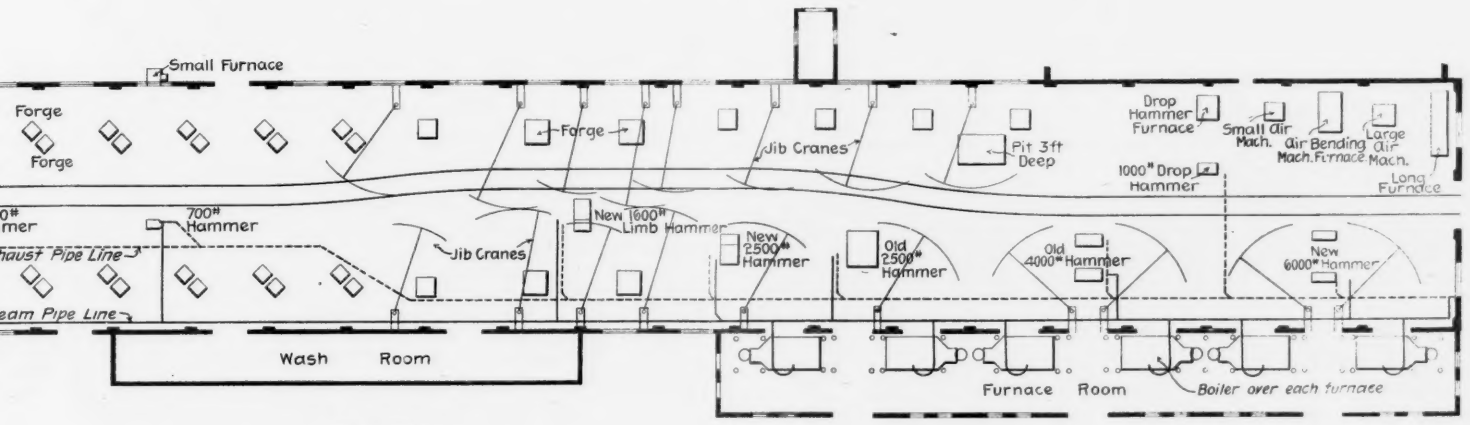
**NEW LOCOMOTIVE REPAIR SHOPS OF THE PHILADELPHI**




**Flanging Furnace in Boiler Shop.**

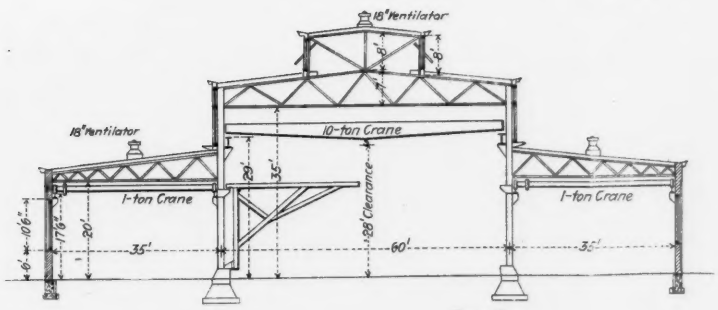


*South Elevation.*

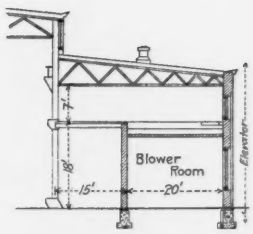


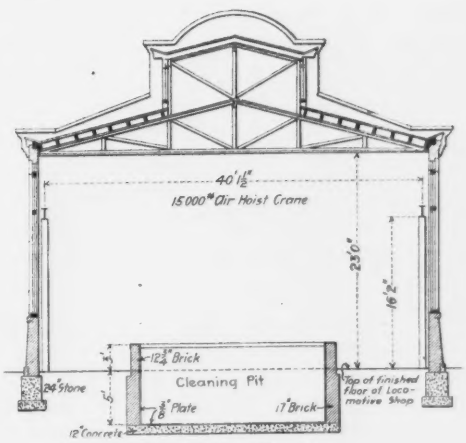

*Floor Plan.*

**Smith and Forge Shops.**




**Foundry.**




**Cleaning Pit House.**

**ILADELPHIA & READING RAILWAY AT READING, PA.**

the collision was due to the neglect of a flagman, who fell asleep.

*xc, 29th, 10 p.m., Cincinnati, Hamilton & Dayton, Oxford, Ohio, passenger train No. 36 collided with two loaded freight cars which had escaped control, and the engine and several cars were wrecked. The engineman and two unknown men were killed and the mail agent and several passengers were injured. The mail car took fire and was burnt up.

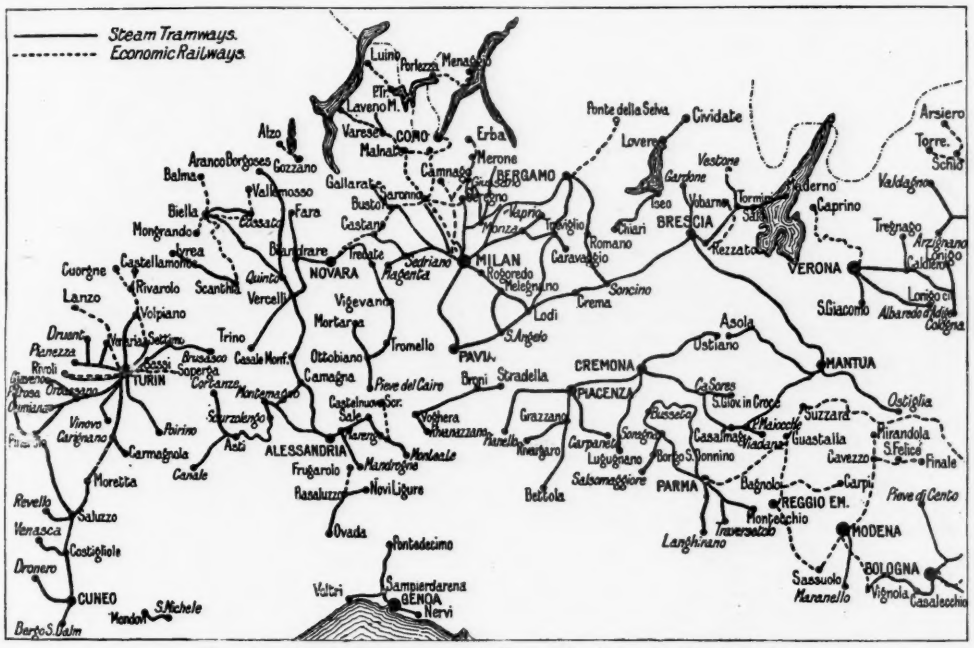
bc, 30th, Pennsylvania Road, Beech Creek, Pa., butting collision between a work train and a freight, badly damaging both engines and eight cars. One brakeman was killed and four other trainmen were injured. There was a dense fog at the time, and it is said that the presence of a train between these two, which had been moved on to a siding, caused a misunderstanding, which led to the collision.

o, 30th, New York Central & Hudson River Railroad, North Tonawanda, N. Y., the locomotive of a freight train was disabled by the rupture of a number of flues and the engineman and fireman were badly scalded.

## Electrical Traction on Steam Railroads in Italy.*

BY PROFESSOR C. A. CARUS-WILSON, M.A.

For a long time past the Italian railroads have been suffering from the competition of tramways and economic lines, which have provided a cheaper and more frequent service, seriously affecting the traffic on the main lines, in spite of every effort made to minimize the injury thus caused. The map A shows the network of steam tramways and economic lines that has spread over northern Italy; these not only radiate from most of the large towns, such as Milan, Turin, Verona, etc., but also serve as links to connect one town with another, as for instance the line connecting Milan with Pavia, which is 20 miles long, and that connecting Brescia and Mantua, which is 43 miles long. The railroad companies have come to the conclusion that the remedy for this competition lies in providing, by means of electricity, a service of short trains running frequently at high speeds.




Map A.—Steam Tramways and Economic Lines in North Italy.

The power-house is at Tornavento, about seven miles from Gallarate. Current is at present being supplied from a steam-generating plant, but a water-driven plant is in course of construction close to the steam power-house, from which the whole line will ultimately be worked. Turbines of a total of 11,000 h.p. will be driven by water taken from the River Ticino.

The power is transmitted as three-phase current at 12,000 volts to seven sub-stations along the line, where the pressure is reduced from 11,000 to 420 volts, and the current is transformed in rotary converters to direct current at 650 volts. From the sub-stations the current is taken to an insulated third-rail.

The motor cars on the Varese line weigh 40 tons unloaded, and have accommodation for 63 passengers seated and 12 standing. Each motor car is driven by four 150 h.p. motors, on the usual one-hour rating, and is geared with a 3 to 1 ratio to 41 in. driving wheels. Full speed on a level is 56 miles an hour. Each motor weighs 2.5 tons. The trailers weigh 27 tons empty, and have accommodation for 63 passengers seated and 27 standing. The goods traffic is to be hauled by electric locomotives. The electric trains are now running and in regular operation as far as Varese, though the service of trains as contemplated is not yet complete.

Thus on the line from Milan to Gallarate the schedule speed has been nearly doubled, and the frequency increased 3.5-fold. On the line from Gallarate to Varese the speed has been increased 75 per cent. and the frequency about 4-fold. The old trains, hauled by steam locomotives, have been replaced by trains of about half their weight, consisting of motor cars and trailers, the normal train consisting of one motor car and one trailer, weighing together 67 tons unloaded, and capable of carrying 165 passengers, or about one-half the accommodation of the steam-driven trains. The carrying capacity of this portion of the line, in passenger miles, has thus been increased 75 per cent. Between Gallarate and Arona and between Varese and Porto Ceresio the speeds have not been increased on account of the grades, which are as much as 2 per cent., and the trains will run with the motors in permanent series connection.

The coal consumed per ton-mile in the steam generating plant, pending the completion of the hydraulic power-house, will probably be not much less than that used on a steam locomotive if the speed and rolling-stock is the same in both cases. Thus, as the weight of the electric trains is about half that of the old steam train, the coal used per train-mile will be halved. Possibly this assumption does not do justice to the economy of the electric system, but there is not sufficient data available to warrant a more favorable estimate being made.

The speed is, however, nearly doubled, so that if the same rolling-stock were used, the tractive resistance, and hence the coal consumption, would be increased. But the type of rolling-stock is being improved, and short two-axle carriages are being replaced by long coaches running on bogies, so that the tractive resistance at the higher speed should not exceed that at the lower speed by more than 25 per cent., bringing the coal consumption to 23 lb. and the cost to 3.4 pence per train-mile.

The author learns from Signor Tremontani, the engineer of the Mediterranean Railroad, that the coal consumption for a service of trains consisting of one motor car and two trailers is 28.5 lb. per train-mile. The weight of these trains is one-third greater than that estimated in the paper, as it was found necessary to add a second trailer on account of the increase in the traffic. This increase in the weight of the train would have brought the author's figure for coal consumption up to 31 lb. per train-mile; his estimate, therefore, appears to be about 10 per cent. too high. At the present time only 20 trains per day are running each way between Milan and Gallarate, and 17 between Gallarate and Varese.

The driver and fireman are replaced by one motorman at about half their combined wages, and, as the electric train is always ready to start up, a further saving of about 20 per cent. should be effected in comparison with a train hauled by a steam locomotive which has to spend a considerable time in the shed. These savings should reduce the item for locomotive wages to 40 per cent. of its former value—that is, to 1.27 pence per train-mile.

The item for conductors' wages will be reduced 20 per cent. owing to the saving of time mentioned above, and will be 1.67 pence per train-mile.

The wages at the generating station will amount to about £4,000 per annum: for a line 80 miles long, and with 28 trains per day each way, the cost would come to 0.58 pence per train-mile.

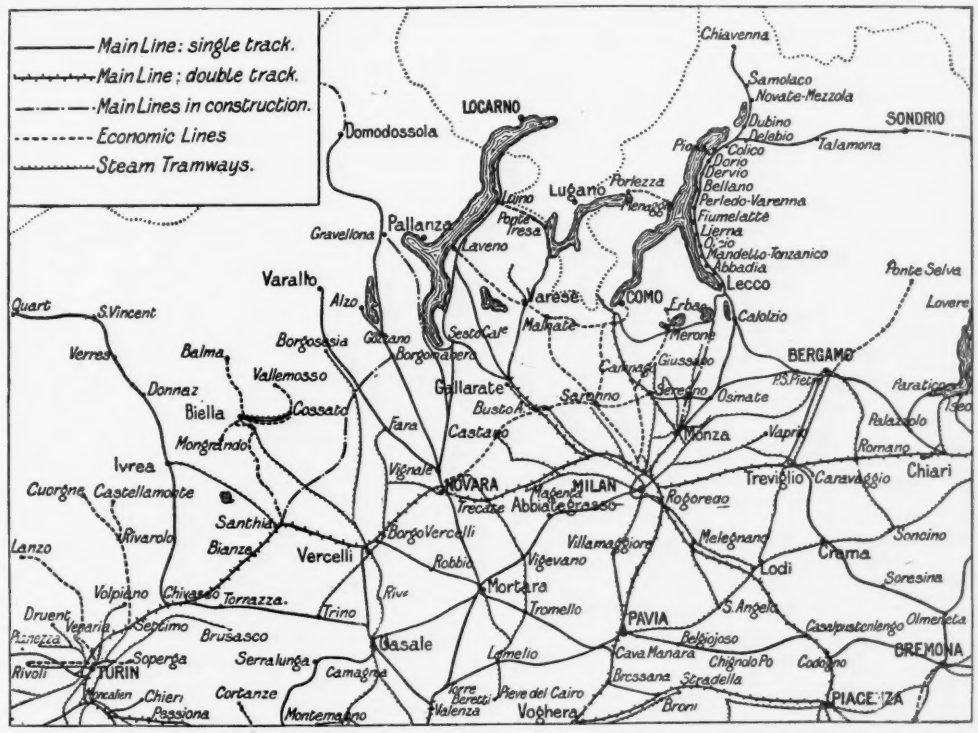
The wages at seven rotary sub-stations should not, together, exceed the wages at the generating station, making the cost for this item 0.58 pence per train-mile.

The cost of water, which is 25 per cent. of that for water and oil combined, will be saved, reducing this item to 0.45 pence.

The cost of repairs will be reduced. On the City and South London Railway, during 1901, the cost of locomotive and generating repairs per train-mile, including wages and materials, was 38 per cent. of the locomotive repairs on the Great Northern Railway. Taking 50 per cent. of the cost of steam locomotive repairs, the cost of repairs for electric motors and generating stations would amount to 1.76 pence per train-mile.

As the electric trains are one-half the length of the steam trains, the carriage repairs per train-mile will be halved; this item will thus be reduced to 3 pence per train-mile. The total cost of running would thus be reduced from 21 pence to 12 pence per train-mile.

The passenger traffic required to pay the expenses of the new electric service can now be estimated. On the Milan-Gallarate-Varese line the service is being in-




Map B.—Railroad Connections in Neighborhood of Milan.

*From a paper read before the Institution of Electrical Engineers (British), May 15, 1902.

creased from 8 to 28 trains per day, while the cost of running is reduced from 21 to 12 pence per train-mile. The cost per mile of line is thus increased from £510 to £1,110 per annum. To this must be added the interest on the capital expended in the electric installation. The total estimated cost is ten million francs, or £5,000 per mile. At 3½ per cent. this would add £175 per mile to the increased cost of running, making the total increase £775 per mile per annum.

The passenger receipts for this line, including the extensions to Arona and to Laveno, are £600 per mile per annum. Hence the passenger traffic must be increased by 129 per cent. to pay the interest and the increased cost of running. With transformer sub-stations the running expenses are decreased 5 per cent., and the increase of traffic must then be 114 per cent.

On the completion of the hydraulic power-station coal will no longer be used, and this item in the cost of running will be saved. The cost per train-mile will then be reduced to 9.31, or, say to 9.5 pence, making the total increase in the expenses £475 per mile per annum, and the increase in the passenger traffic required to meet this increase 80 per cent., as compared with 129 per cent. for a steam plant. With transformer sub-stations the increase need only be 72 per cent. The value of water-power may therefore be represented by a reduction of 20 per cent. in the passenger traffic required to pay expenses.

On the Lecco line the service of steam trains was formerly about half as frequent as on the Varese line. The proportional increase in the number of electric train-miles will be about the same, so that the increase in the cost of running per mile of line, with transformer sub-stations, will be £150 per annum with water power. The capital expenditure has been about eight million francs, or £5,000 per mile, involving an interest charge of £175 per annum, which, together with the increase in the running expenses, brings the total increase to £325 per annum. The passenger receipts are here much less than on the Varese line, being £380 per mile per annum for the section Lecco-Colico, £220 for the section Colico-Sondrio-Chiavenna, and £330 per mile for the whole line. Thus an increase of £325 per annum will require an increase in the passenger traffic receipts of 128 per cent. The conditions of working an electric service on this line are therefore not quite so favorable as on the Varese line.

The extent to which a combination of reduced fares and increased traveling facilities augment traffic has long been made a subject of careful consideration. For some time past the Adriatica Company has been investigating this question experimentally on the line connecting Bologna with St. Felice, referred to above. The experiment was made with cars driven by electric accumulators. The speed and the frequency of the trains were both doubled, and the fares reduced to 40 per cent. of their original amount. The result has been that the passenger traffic has increased five-fold, and the receipts have been doubled.

With the new electric service on the Milan-Varese line the minimum fare is still about the same as before, namely, a halfpenny a mile, but whereas formerly this rate only entitled a passenger to travel on an omnibus train, it now entitles him to travel by any of the express trains, the speed of these trains being twice what it was before, and the service three to four times as frequent, so that for those who formerly patronized the express trains the fares have been halved and the speed doubled. The speed of the omnibus trains is also doubled, but owing to the number of stops the saving in time is not more than 30 per cent.

The new service has been inaugurated in confident expectation that the improved service will increase the amount of traffic to such an extent that the receipts, even at the lower rates, will more than pay the expenses.

## Freight-Train Loads.

We quoted Oct. 31, page 827, some of the remarks of Col. W. V. Constable, R. E., on American locomotives. Below are some extracts from the same installment of his very minute and intelligent report:

On April 19, the General Manager of the N. Y. C. R. R. gave me a photograph of their most powerful goods engine—Appendix Q—and told me that two days previous a similar engine hauled between Syracuse and Albany, a distance of 150 miles, 94 cars weighing 3,783 American tons, the capacity of most of the cars being from 60,000 lbs. to 80,000 lbs. The engine is an eight-wheeled coupled compound, with pony truck, and boiler pressure of 200 lbs., weight on driving wheels 164,000 lbs., and on bogie truck 26,000 lbs. Its cylinders are 23 in. and 35 in. by 32 in., and diameter of drivers is 63 in. Total weight, 190,000 lbs. without tender, and about 136 tons with tender. This train was some 3,600 ft. long, and the sidings between the main track where such trains have to be crossed have to be made nearly one mile long.

Again, on April 20, the General Superintendent of the terminal division of the P. R. R. at Jersey City told me that the P. R. R. every-day practice was for an engine to draw 2,500 gross tons of grain and 3,000 gross tons of coal cars on the level portion of this road, and some of the trains I passed on my way to Baltimore the same day were enormous in length, and were actually of this weight.

Exactly the same thing happens on the B. & O. R. R., the gross weight, however, only rising to 2,700 tons, on account of the steeper grades.

On May 10, the Superintendent of Transportation and the Superintendent of Terminals of the Central R. R. of New Jersey told me that in the summer time, on the level portions of their line, one engine often hauled 3,200 tons, and I myself saw trains of 50 to 80 cars on my way to Baltimore. In fact, on the level, where the loads can be obtained, loads of from 2,000 to 3,500 gross tons are common practice on lines east of the Mississippi.

The book of engine ratings of the P. R. R., furnished as Appendix S, is most interesting, and is as good an example as can be required of the enormous loads hauled on certain sections of this railroad, and is typical of what is done every day on the P. R. R. and on the N. Y. C. R. R., and some other roads which deal with a large ore and coal or grain traffic. The Pittsburgh & Erie R. R. also daily runs trains with one engine having a gross load of 4,000 tons behind the engine, and on May 22 I saw such trains working.

This P. R. R. rating book shows that after deduction of the "loss by resistance" the gross load behind one of their most powerful engines on certain sections is 3,200 tons. On account of the shortness of some of the sidings, which are only 3,600 ft. long, trains are usually limited to 86 cars, and when I was traveling with the General Manager of the P. R. R. I saw more than one train of this length, and he told me that one engine had hauled into Conway Yard, the great sorting yard just west of Pittsburgh, with 35 miles of sidings, a train 6,200 ft. long and weighing 4,200 tons. I passed a loaded goods train of 93 box cars, and an empty train —a few loaded were in it—of 103 cars. On my return from Pittsburgh to Philadelphia I passed several goods trains hauling on the level or down grades 2,700 tons.

When at Altoona and Philadelphia I was told that the H5 Class, practically similar to the H6 Class, constantly pulled 3,300 tons on the level, and one, some little time ago, hauled an experimental train 132 miles from Altoona to Harrisburg at an average speed of 10 miles an hour, the train weighing 5,212 tons. These are facts as given me by Mr. Ely, the Chief of Motive Power, himself.

The Union Pacific compound freight engine is six-coupled and pony truck; cylinders, 15¼ in. and 26 in. by 30 in. stroke; pressure, 210 lbs.; weight on drivers, 161,000 lbs.; total weight, 185,000 lbs.; in working order with tender, 300,000 lbs.

They haul at an average speed of 23 miles 1,400 gross tons, or 2,000 tons at slower speed. An experimental train run last year was one mile long, and weighed 10,000 gross tons, or 149 cars, on a down grade. The distance run was 102 miles, and the trial was satisfactory. All this information was given me by the Divisional Superintendent of the Wyoming Division.

On the Central Railroad of New Jersey the Transportation Superintendent I met at Jersey City told me that they hauled in the busy summer season 3,200 tons gross with a simple engine working at 200 lbs. boiler pressure. The engine weighed 105 tons without its tender, the weight on the eight driving wheels being 83 tons. He also stated that two engines, by way of experiment, had hauled a train of 4,400 gross tons up a grade of 22 ft. to the mile.

The Baltimore & Ohio big freight engines draw trains weighing 2,700 tons eastward into Baltimore, the line having many gradients of 43 ft. to the mile—1 in 123. If it were level these engines are said to be capable of hauling 4,000 gross tons. The eastbound loads between Cumberland and Brunswick—102 miles—are 2,750 tons, but as soon as the grades are improved and heavier rails put down it is hoped to haul 3,200 tons from Cumberland right into Baltimore—175 miles.

On the B. & O. R. R. on the mountain grades I passed one train of 70 empties weighing 1,100 and one of 60 coke wagons going eastward and downhill weighing 2,500 tons, also another of 45 pressed steel cars weighing 2,700 tons.

The Locomotive Superintendent gave me 70 tons as the average gross weight of a loaded ore or coal pressed steel truck in a train, and 45 to 50 tons as the average weight of a grain-loaded car forming part of a train.

I give below a memorandum handed me by the Divisional Superintendent of the N. Y. C. & H. R. R. at Albany on June 7. He was just about to despatch the information to his General Manager, and it should dispose of any idea that my notes exaggerate facts.

The figures make one's mouth water, and set one thinking why India with its 5 ft. 6 in. gage should not go one better.

"Memorandum showing the numbers of engines, number of cars, and tonnage of eastbound freight trains on the Mohawk Division of the New York Central Railroad between Syracuse and Albany, from 8 a.m., June 4, to 8 a.m. June 6."

| Engine. | Cars. | Tons. |
|---|---|---|
| 1,758 | 62 | 2,652 |
| 1,744 | 68 | 2,726 |
| 1,779 | 68 | 2,208 |
| 1,709 | 66 | 2,692 |
| 1,569 | 53 | 1,790 |
| 1,705 | 59 | 2,652 |
| 1,752 | 60 | 2,647 |
| 1,771 | 67 | 2,773 |
| 1,730 | 64 | 2,703 |
| 1,713 | 70 | 2,587 |
| 1,710 | 67 | 2,760 |
| 1,715 | 73 | 2,668 |
| 1,786 | 68 | 2,744 |
| 1,784 | 68 | 2,348 |
| 1,778 | 68 | 2,395 |
| 1,735 | 68 | 2,649 |
| 1,727 | 69 | 2,538 |
| 1,690 | 54 | 1,721 |
| 1,781 | 71 | 2,260 |
| 1,775 | 75 | 2,627 |
| 1,745 | 66 | 2,049 |
| 1,731 | 73 | 2,503 |
| 1,730 | 62 | 2,348 |
| 2,332 | 80 | 3,336* |

*100 engines of this type have been ordered.

These trains were hauled over maximum grades of 18 ft. Where the grades exceed that amount, helping engines would be used.

I also give three typical performances of main-line freight trains, as usually run over the Mohawk Division of the N. Y. C. R. R., eastbound, in May, 1901, as furnished to me the day before I sailed for England.

*Case No. 1.*

| | |
|---|---|
| Loaded cars | 91 |
| Train mileage | 140 |
| Helping mileage over grades | 18 |
| Total weight of lading, tons | 1,884 |
| Total weight of cars, tons | 1,089 |
| Total weight of lading and cars, tons | 2,973 |
| Per cent. of lading to total weight of train | 63.3 |
| Average lading per car moved, tons | 20.7 |

*Case No. 2.*

| | |
|---|---|
| Loaded cars | 85 |
| Train mileage | 140 |
| Helping mileage over grades | 14 |
| Total weight of lading, tons | 2,437 |
| Total weight of cars, tons | 1,288 |
| Total weight of lading and cars, tons | 3,725 |
| Per cent. of lading to total weight of train | 65.4 |
| Average lading per car moved, tons | 28.8 |

*Case No. 3.*

| | |
|---|---|
| Loaded cars | 82 |
| Train mileage | 140 |
| Helping mileage over grades | 14 |
| Total weight of lading, tons | 1,896 |
| Total weight of cars, tons | 1,238 |
| Total weight of lading and cars, tons | 3,138 |
| Per cent. of lading to total weight of train | 60.4 |
| Average lading per car moved, tons | 23 |

The average freight in a freight train, including both loaded and empty cars of the N. Y. C. R. R. system, is as follows: On all lines and branches, 398 tons; on all main-line trains, east and westbound, 794 tons; the average load of all loaded freight cars is 15 tons.

## TECHNICAL.

### Manufacturing and Business.

The Bernhisel Construction Co., of Evanston, Ill., has been incorporated with a capital of $15,000 to build bridges and do general contracting.

R. S. Masson has been appointed Consulting Electrical Engineer of the Los Angeles Railway Company and will have charge of all electrical machinery and apparatus.

A. E. Domville, who has been connected with the St. Thomas Car Wheel Works for 18 years, has been appointed General Manager of the New York Car Wheel Works, at Buffalo, N. Y.

Messrs. Dodge & Day, modernizing engineers, have been commissioned by their clients, the Heating, Ventilating & Foundry Co., of Pittsburgh, to fully equip the new plant which is being erected for that company at Wheeling, W. Va.

Through the efforts of the Thornton N. Motley Co., Southern Agents for the American Steel Foundries Co., the Gallagher steel coupler, manufactured by the latter company, has been specified on all equipment of the Central Railroad of Georgia.

The Crocker-Wheeler Company, Ampere, N. J., manufacturers of electrical machinery, reports that its new mill building is now being occupied, enlarging the floor space by 60,000 sq. ft., giving increased facilities for prompt deliveries on large orders.

The Federated Railway Development Co. has been organized at Kittery, Me., to build locomotives and other engines and to carry on a general transportation business. Its capital stock is $2,000,000, none paid in, and the officers are: President, John Drew, of Boston, Mass.; Treasurer, Louie S. M. Hood, Boston.

The Atlantic Insulated Wire & Cable Co., of Stamford, Conn., announces the appointment of George F. Porter as Sales Manager. Mr. Porter's office will be at 120 Liberty street, New York City. He is the well known long-time secretary and treasurer of the National Electric Light Association, and for the last five years has been Manager for the Kerite Co.

The Philadelphia Pneumatic Tool Co. has just completed the equipment of the new navy yard at Kiel, Germany, with an outfit of Keller pneumatic tools. This company also reports an increasing trade on the Pacific Coast. Mr. O. A. Berger, the representative of the Philadelphia Company in San Francisco, has just visited the home office, bringing with him some large orders from the various shipyards, steel works, etc., on the Pacific coast.

The Chicago Pneumatic Tool Company is mailing to the trade a four-page circular, designated as Special Circular No. 32, attractively designed in black and red on enamel paper, illustrating the Tynan patent annealer and the Tynan rivet heating forge. This company has secured the entire control of these devices and will be the exclusive manufacturer of same in the future. The annealer and rivet forge fit in very nicely with the line of pneumatic appliances which the company manufactures, as they operate by compressed air, using crude oil as a fuel. They are designed for the various classes of repair work incident to shipyards, railroad shops, etc., and numerous demonstrations have shown them to be well-suited to this class of work. Both machines are light in weight and therefore easily moved from place to place, a desirable feature in the class of work for which they are adapted. Many orders have been received for these devices during the short period they have been on the market, making

necessary an increase in the present facilities for their manufacture.

### Iron and Steel.

The Jarvis & Bros. Co., of Huntington, W. Va., has been formed to carry on the business of a foundry and malleable iron works.

The Mohawk Valley Steel & Wire Co. has been incorporated by Portland, Me., capitalists with an authorized capital of $25,000,000. John T. Fagan is President and Geo. F. Gould, of Portland, is Treasurer.

The Kansas City, Mexico & Orient is reported to have placed an order with the Carnegie Steel Co. for 150,000 tons of rails, which are to be delivered in 10,000-ton lots. This road was reported some months ago to have placed orders abroad for rails.

The Republic Iron & Steel Co. has authorized J. H. Nutt, Secretary of the Labor Bureau of that company, and T. J. Shaffer, President of the Amalgamated Association of Iron & Steel Workers, to consider plans by which the employees of the company may become stockholders in it.

The Virginia Iron, Coal & Coke Co., which has been in the hands of a receiver since 1899, has been reorganized with $10,000,000 capital. Henry M. McHaig is President, Archer A. Pholegar Vice-President, and John C. Newton General Manager. On Jan. 1 it will remove its offices from Bristol to Radford, Va.

The Union Steel Co., which is the consolidation of the Sharon and Union steel companies, is to be financed as a $75,000,000 company. There is to be a bond issue of $25,000,000, in addition to the authorized stock issue of $50,000,000. About $18,000,000 of the bonds and some $33,000,000 of the stock will be issued at once. The proposed 200-mile railroad from Elk Creek Harbor to the works at Sharon and Donora and to the Connellsville coke fields, for which contracts are to be let early next year, is not to be considered in the reserve securities but will be financed independently.

### The New Rod Mill at Monessen.

The rod mill department of the Pittsburgh steel mill was started by President Rowe on Dec. 3 and it is now rolling billets. This is the most complete rod mill of its kind in the world and its annual capacity is 130,000 tons. The plant is built entirely of steel, the dimensions of the building being 184 by 300 ft. It is equipped with two 220-h.p. Corliss, and one Buckeye engine of 2,500-h.p., which operates one 16-in. and one 14-in. and three 10-in. mills.

### Rails for Canada.

The time to receive bids for 25,000 tons of rails for the Department of Railways and Canals, Canada, is extended from Dec. 15 to Jan. 15, 1903. The rails are to be 80 lb. section and are to be delivered on or before May 1 to the Intercolonial Railway, half the quantity at St. John, N. B., and the rest at Halifax. L. K. Jones is Secretary, Ottawa, Ont.

### Electric Power for Irrigation.

The Northern California Power Company has recently installed a 4,000 h.p. generating plant at the Cow Creek station, in the high Sierras. The ultimate capacity of the station will be 8,000 h.p. The company has already installed 3,000 h.p. at another generating station, known as the Battle Creek station, thus making the present total capacity of the company's electrical installation 7,000 h.p. One use of this power is for irrigation. Many thousand motors are already in operation in California driving pumps for irrigation work, and immense developments are yet to ensue from this application of electric power. The apparatus which the Northern California Power Company has recently installed consists of two 1,500-kilowatt, 3-phase, Westinghouse alternators, which will be driven by impact water-wheels supplied with water under a head of approximately 900 ft. The transmission will be at 34,000 volts. The Battle Creek station is likewise equipped with Westinghouse apparatus.

### Westinghouse Magnetic Brakes in England.

The Chatham & District Light Railway Company (Electric) has given orders for the equipment of its cars with the Westinghouse magnetic brake. The order has been placed with the British Westinghouse Electric & Mfg. Co.

### Electric Interlocking in England.

In the *Railroad Gazette* for Jan. 11, 1901, appeared a description of what is now known as the "Crewe system" of electric power working of railroad switches and signals. On Nov. 19 a large party of railroad officers and others were shown over the installation at Crewe where there are now five signal cabins equipped and at work, which contain 60, 152, 95, 75 and 57 levers respectively. As all the extensive rearrangement of the tracks at Crewe is not yet completed the signal work proposed has not all been carried out as yet, and there are five other cabins still to be put up, one of which will contain the unprecedented number of 350 levers.

As previously stated the points are worked by motor with a current of 20 amperes and 100 volts, and the motor runs at a speed of about 800 revolutions a minute so enabling the switches to be moved over in about three seconds. The signals are actuated by an electro magnet combined with a solenoid, and a current of about 15 amperes and 100 volts is required for a fraction of a second to pull the arm to the "off" position when the current is passed through a resistance reducing it to about two amperes, which is sufficient to hold the signal off. The makers of the Crewe system are the Railway Signal Co., Ltd., Fazakerly, near Liverpool. They have issued a handsome book of 30 pages, 11 in. x 9 in., describing the principal features of the apparatus and showing track plans of some of the installations.

### The Barrett Jack Patents.

The Duff Manufacturing Company, of Pittsburgh, has brought two suits in the United States Circuit Court for the Northern District of Illinois, against Templeton, Kenly & Co., Limited, of Chicago, for infringement of the Barrett patent No. 455,993, granted July 14, 1891; and the other for infringement of the Barrett patent No. 527,102 granted Oct. 9, 1894, by the manufacture of the lifting jacks lately placed upon the market by Templeton, Kenly & Co. known as the "Simplex" jack. The first of these patents covers the automatic lowering mechanism known as the "yielding tripping plate" embodied in the Barrett jack No. 10 made by the Duff Manufacturing Company. This patent has been sustained by the Circuit and Appellate Courts on numerous occasions, and automatic lowering jacks of the same general type as the Simplex jack have been held to infringe the patent. In the second suit it is also claimed that the Simplex jack infringes the later Barrett patent, as well as the one which the courts have previously considered. Motion for preliminary injunction restraining the manufacture of the Simplex jack pending the suit under the earlier Barrett patent has also been made, and will probably be brought up for hearing some time this month.

### World's Pig Iron Output in 1902.

The statistics of pig iron output for the first half of the current year are now available for most of the principal iron-producing countries of the world. Those for the United Kingdom show a notable increase on the output for the first six months of 1901. Those for the United States show an increase of 1,133,961 tons on the first six months of 1901. The statistics for Germany are available up to the end of September last, and show for the nine months an increase of 303,376 tons. France for the six months ending June 30 last has a decrease of 95,531 tons on the make of the corresponding half of 1901. Belgium for the nine months ended Sept. 30 shows the remarkable increase of 223,710 tons, or 40 per cent. Sweden for the first six months shows a decrease of 27,000 tons, compared with the first six months of 1901. Finally, in the case of Canada, there has been an increase for the same six months of not less than 62,780 tons, which is the greatest advance hitherto made in the history of the Canadian iron industry. The total increase of production in four of the countries named—the United States, Great Britain, Germany, and Belgium—has been over 1,800,000 tons, or at the rate of more than 3½ million tons a year.—*Iron and Coal Trades Review.*

### Another Bridge Building Company.

The Carolina Bridge & Steel Co., incorporated in September, has leased the shops of the North Carolina Railroad at Burlington, N. C., and is now receiving the equipment of machinery. The capital is $250,000 and the incorporators are: E. P. Wharton, of Greensboro, N. C.; F. J. Murdoch, of Salisbury, and Robert W. Curtis, of Burlington. The officers are: E. P. Wharton, President; David White, Vice-President, and J. W. Murray, Secretary and Treasurer. Robert W. Curtis is the manager of contracting and erecting. The shop superintendent is John C. Ort, late of Pittsburgh, Pa., and Louisville, Ky. All the machinery will be driven by electricity. All the tools in the various buildings will be driven by compressed air and electricity, with the exception of one steam riveter and one steam double-arm trip-hammer. It is expected work will be begun by March 1. Several large contracts for railroad as well as highway bridges have been closed.

### The Submarine Torpedo Boats.

The Naval Board appointed to report upon the trials of the submarine boats "Adder" and "Moccasin," in their report on the "Adder" recommend that she be accepted after some unfinished work is satisfactorily completed, but says that while the tests made fulfill the strict letter of the contract, no provision is made for trial under service conditions at sea; and on account of the novel character of the vessel it is impossible to predict from her performance in the smooth waters of a harbor what her behavior in even a moderate seaway will be. It is recommended that when other vessels of her class are tried one of them should pass endurance tests at sea, both in light condition under the gasoline engine and, when submerged, under the electric motor, on conditions to be prescribed by the Board. Pending such trial the Board reserves its opinion as to stability, maneuvering powers and habitability when at sea. Several changes in the method of installing controllers for the motors are recommended for any future submarine boats.

### Prizes for Railroad Papers.

The Pacific Coast Railway Club, as already stated in these columns, is offering $250 in prizes for papers pertaining to the construction, equipping, maintaining and management of steam railroads, the papers to contain not less than 2,000 nor more than 6,000 words. The time in which these papers are to be submitted has been extended from Jan. 1, 1903, to Feb. 1. The contest is open to members of any railroad club in the United States. The prizes will not be awarded from a literary standpoint, but according to their intrinsic value to the railroad world. Five judges will be selected from leading railroad officials of the Pacific Coast and to eliminate all possibility of favoritism, the papers will be numbered and the names withheld until the decision of the judges has been made. The $250 will be divided into four prizes, as follows: First prize, $100; second prize, $75; third prize, $50; fourth prize, $25. Manuscript should be sent to Mr. C. C. Borton, Secretary, 1213 Twelfth street, Oakland, Cal.

### To Enlarge Standard Steel Car Works.

The Standard Steel Car Co., which only a short time ago finished its new plant at Butler, Pa., has already found it necessary to make extensions and has just let contracts for equipment costing several thousand dollars. The present plant has a capacity of 60 cars a day and the new equipment will increase this to 80, of which 50 will be all steel and 30 wooden cars with steel underframes.

### British Westinghouse Company to Increase Capital.

It has been found necessary to increase the capital of the British Westinghouse Electric & Mfg. Co., to provide for extensions. The growth of the company has been so rapid that the directors on Dec. 3 decided to increase the capital of $5,000,000 of 6 per cent. preferred stock to $6,000,000 by issuing $1,000,000 of new 6 per cent. stock of a par of $25, payable half at once and the remainder in the spring. In a report issued on the same day it is stated that orders received since Aug. 1 exceed in value $4,125,000, compared with a total of $4,660,000 for the year ending July 31. Despite the fact that during the year most of the orders taken by the British company were filled in America, the profits of the British company for the year ending July 31 were $303,430. Hereafter all contracts will be executed in the big works at Trafford, near Manchester. This will insure a much larger profit.

### Sale of an Ohio Car Works.

The plant of the Youngstown Car Manufacturing Co., Youngstown, Ohio, has been sold to Thomas Anderson, of Pittsburgh. The price is about $100,000. The plant has not been in operation for a year. It made and repaired wooden cars. Mr. Anderson was formerly Master Mechanic of the Pittsburgh & Western. It is stated that steel cars will be built. The following are the officers: George T. Oliver, Pittsburgh, President; Alexander C. Blair, Secretary and Treasurer; Thomas Anderson, Deal Manager. Lucius E. Cochrane and B. F. Boyd, of Youngstown, are additional directors. The general offices will be removed to Pittsburgh.

### Westinghouse Air Brake Business.

President George Westinghouse, of the Westinghouse Air Brake Company, in the report made at the annual meeting, said in substance: The business of the past year shows a considerable increase over that of any of the former years. Notwithstanding a very large reduction in the selling price of freight brakes, the net results are substantially the same as last year. For convenience of operation there has been formed the Standard Traction Brake Company, with a capital of $100,000, all of the shares of which are held by the Westinghouse company, and to which has been transferred the conduct of the electro-magnetic and other street-car brake business. The progress of this department of the business has been very satisfactory, in view of the fact that it is passing through a period of development, and it is expected that the present fiscal year will show profitable returns. Large orders are now in hand and the field seems almost unlimited. The friction-draft gear has assumed considerable importance. After paying its proportion of the general expense of this company, which during the past fiscal year has been about one-tenth, there has been a net profit of $81,295. The interests of the company in foreign brake companies have increased considerably in value, owing to the satisfactory results of their operations. The reports of a consolidation of air-brake companies is denied explicitly.

### A Compound Consolidation for Norway.

The Norwegian State Railroad has just had built in Switzerland, at Winterthur, some consolidation engines with large boilers for Europe. The diameter of the boiler is 66 inches inside, while the total heating surface is 1,912 sq. ft. The two cylinders are 21⅝ and 32¼ in. in diameter with a stroke of 25¼ in. The working pressure is 174 lbs. per sq. in., and the weight available for adhesion is 62 tons, the total weight being 72 tons. The engine is required to work over grades of 1 in 60, with curves of 975 ft. radius; the wheels have side play, by an Austrian device.

### Car Heating—Infringement of Patents.

The following letter from the Gold Car Heating & Lighting Co. explains itself: "Our attention has been called to the notice published in last week's *Railroad Gazette* on page 930, charging infringement of certain patents of the Safety Car Heating & Lighting Company by some concern not named. As a number of our patrons have asked us about this matter, we would like to say distinctly, through your columns, that neither of the patents referred to by the Safety Company covers any of the systems which we manufacture. We have been informed that the Safety Company intends to bring an action for infringement against some car heating people, other than ourselves, but as they did not state that the Gold Company is not involved, we believe it necessary to make the matter plain. In every action in which our company has had to deal with litigation of this character, we have invariably been victorious, it being a fact that our systems are so distinctively original that they are not within scope of any patents granted to other manufacturers. Our devices are well protected by numerous patents, and we have always been zealous to protect our patrons, as well as to maintain our own rights."

### Another Rail Mill.

The plans of the new Union Steel Company are more extensive than at first supposed. An officer has said:

"We propose to build a rail mill either at Donora or Sharon, which will cost $5,000,000, that will be almost as large as the Edgar Thomson works of the Carnegie Company. We expect to expend from $25,000,000 to $30,000,000 in improvements; we have had plans prepared for an extension of the West Side belt line into the Connellsville coke country and down the Ohio, along the Beaver and through Sharon to Elk Harbor." It is said the rail capacity of the new plant will be 50,000 tons a month. Additions will be made to the open hearth steel output. The output of the open hearth department of the Union Steel Company, when present work is completed next fall, will be 1,200 tons a day, while the present output of the Sharon Company open hearth furnaces is 1,100 tons a day. Surveys for the railroad have been made by the Pittsburgh Terminal Railroad & Coal Company. The West Side belt line of this company is now being extended to Clairton.

## THE SCRAP HEAP.

### Notes.

At the Houston (Texas) shops of the Southern Pacific a hospital car is being built.

The Philadelphia Hedge Company is making extensive improvements on the grounds around many of the stations of the Long Island Railroad.

The Pennsylvania Lines West of Pittsburgh, repeating the arrangement of last winter, has hired 100 locomotives of the Duluth & Iron Range.

The Canadian Northern has made an agreement with the Great North Western Telegraph Co. to transact all commercial business for the telegraph company in Manitoba.

Among the railroads which are reported this week as making important increases in the pay of employees are the Delaware, Lackawanna & Western, the Canadian Pacific and the Chicago & North Western.

A press despatch from St. Louis states that the Burlington road will, on Jan. 1, cease running trains across the Mississippi River bridge at Alton. It is said that this will result in the abolition of eight passenger trains between St. Louis and Alton.

The Missouri Pacific has issued an order that after Jan. 1 no officer of the road shall have in the employ of his department any relative of himself. Where such relations now exist they must be discontinued before Jan. 1. Where practicable persons discharged by this order will be given employment in other departments.

A press despatch says that the auditor of the St. Louis & North Arkansas Railroad has been arrested for forging signatures to coupon tickets. It is said that coupon tickets issued by that road were taken from the vaults of the company and sold to ticket brokers in large cities, the first, or the first and second, coupons being torn off.

At a conference in Salt Lake City last week between officers of the Union Pacific and the Chicago, Milwaukee & St. Paul arrangements were made for through cars over these roads between Chicago and San Francisco. According to reports, one of the three through passenger trains daily will have through cars over the Milwaukee road, one will have cars only over the Chicago & North Western, and the third will have some over each of these two roads. Hitherto, the North Western has had an exclusive contract with the Union Pacific.

Mr. Bernard N. Baker, of Baltimore, former President of the Atlantic Transport Line, which has been merged in the International Mercantile Marine Company, is to give about $300,000 worth of stock of the larger company to 300 old employees of the Atlantic Transport Line. The *Baltimore American* says that those who continue in the employ of the new company will receive stock equal, at a fair valuation, to a year's salary, while those who are thrown out of their positions by the consolidation will receive an amount equal to two years' salary. A few will receive a still larger proportion.

An officer of the Pennsylvania Lines West of Pittsburgh has given a reporter a few notes on the recent enormous freight movement through Pittsburgh. He says: "I may as well say at the outset that it is impossible to give figures that will convey a definite idea to the public. At the present time the transfers through the Pittsburgh terminals of the Pennsylvania are about 4,500 cars a day. This includes all divisions. If we can bring this average to 5,000 per day, as we did last Sunday, we can relieve the congestion. I would say that we are now about 18 hours behind. That is to say, if we did not receive any business it would take us about a day to clean up what we have. One of the causes that contributed to the congestion was the reversal of ordinary movements on account of the hard coal strike. Another was the increase in business which we could not foresee. The committee that meets twice a day under the direction of Mr. Patterson has done much to relieve the conditions. Heretofore the various superintendents did not know what was going on on the other divisions. For instance, the Pittsburgh Division might send a number of trains to Conway when the yards there were not in a condition to receive them. The result would be a congestion on the main-line tracks. As it is now, the superintendents are acquainted with the condition of every yard and movements are regulated accordingly. Naturally, if we could get enough engines we could do better. Not only have the prices advanced, but the time of deliveries. I know of a Pittsburgh railroad a short time ago that paid a bonus of $1,000 for 25 engines intended for another line. There is no general embargo. There are embargoes, however, placed on some large shippers."

### Traffic Notes.

A bill is before Congress, and has passed the Lower House, changing the limit of time beyond which live stock must not be kept in cars without food and water. The time is changed from 28 hours to 40 hours.

The State Railroad Commissioners of Missouri announce that they are going to appeal to the Supreme Court of the State to compel the railroads to obey the recent order by which the Commissioners directed that grain be delivered to elevators at Kansas City without making a charge of $2 for reconsignment.

The Great Northern appears to have secured a "scoop" on the other trans-continental roads in getting in bids for military transport service across the Pacific Ocean. Officers of the Atchison and the Southern Pacific went to Washington to get the matter re-opened but Secretary Root does not seem inclined to favor them.

The Secretary of Agriculture has asked Congress for an appropriation of one million dollars for the extirpation of the foot and mouth disease in New England. Officials of the Agricultural Department of the State of New York are maintaining a rigid quarantine against infected cattle, 40 special inspectors having been appointed.

The Interstate Commerce Commission announces that it will hold a hearing in Washington, Dec. 16, to consider whether or not the advances in freight rates which have recently been announced by the trunk line railroads are justified. Among the roads summoned, besides the Trunk Lines and their western controlled lines, are the Southern Railway and the Wabash.

After six postponements the petition of certain business men in Illinois for a general reduction in freight rates was considered at a hearing of the State Railroad Commissioners at Springfield last week. It is said that the inquiry brought to light the fact that the railroads had almost universally neglected to comply with the law requiring tariffs to be filed with the Commission at Springfield.

There is only one story regarding traffic. All through the east and west the principal roads continue to be crowded beyond their capacity. The Atchison people say they are getting more business than they can comfortably handle. The Burlington and the Rock Island say the same. In central traffic territory hundreds of cars are standing on side tracks waiting for power. In Trunk Line territory the same condition of affairs prevails.

The compromise settlement of the Colorado fuel and iron squabble leads to the belief that the principals, Messrs. Gould and Harriman, will continue the contest in other fields. The action of the Southern Pacific in withdrawing its New York freight business for North Texas points from the Texas & Pacific, and in transferring its passenger business from the Louisville & Nashville station at New Orleans to the Illinois Central station is said by the gossips to be the first straw pointing to a persistent fight between the two interests.

The embargo on live stock which has been established by the Secretary of Agriculture on account of the existence of foot and mouth disease among cattle in Massachusetts has not only stopped all export of western animals through Boston, but has resulted in orders to all station agents in New England to refuse cattle, sheep and swine. The governor of Illinois has ordered a quarantine against cattle from the eastern states generally (?). At this the governor of Pennsylvania has made a vigorous protest, pointing out that there is no sign of any contagious disease among cattle in Pennsylvania or in any state adjoining Pennsylvania.

Secretary N. B. Kelly, of the Freight Bureau of the Trades League of Philadelphia, has issued a circular calling the attention of merchants to the uselessness of sending tracers after small shipments of freight; that is to say, any in less than carload lots, except when there is an unusual delay. Mr. Kelly calls attention to the fact that such tracers usually do not accelerate the movement of the freight and that both the railroads and the shippers themselves are put to much unnecessary labor and expense. We judge that Mr. Kelly must have been a freight agent himself. His circular will certainly be appreciated by everybody connected with a freight office—provided those who receive it follow the advice which it gives.

### English Notes.

The new bogie coal wagons of the Midland are now running in the service of the locomotive department. They are similar to those of the Caledonian, though without continuous brake. The Great Western are also considering the question of the use of high capacity wagons for their locomotive coal traffic.

It is reported that the Great Northern is building at Doncaster a new express passenger engine with a boiler 66-in. in diameter. The engine is of the "Atlantic" type, so the report says.

The North Eastern is trying the Holden system of oil firing with good results.

The braking of goods trains in England is a question that is occupying the attention of the operating department and there have recently been some experiments with the new rapid acting vacuum brake. R. HOPE.

### Trusts and Wages.

Sir Alfred Mosely and some English workingmen are in the United States studying industrial conditions. In Cleveland a few days ago Sir Alfred Mosely said: "The great question to-day is the relationship between capital and labor. I am going to say a word about trusts and that is the trust will be able to put your wages upon a scale not possible under competition. I am in favor of organized labor and of trade unions. But unions must learn some things by bitter experience and I have faith that these mistakes once seen will be remedied. Unions are the natural outcome of organized labor. It augurs well for the successful solution of such problems when men like Senator Hanna step forward. I am hopeful of the future when capital and labor forgetting quarrels will work together hand in hand."

### American Electrical Machinery in Asia.

The United States Minister at Seoul sends extracts from a report in a Japanese newspaper, in which mention is made of the plant of the Seoul Electric Company. This plant is said to be the largest single electrical plant in Asia. It was built for the Korean Company by the American firm of Collbran & Bostwick. The company operates a trolley road about 12 miles long and furnishes incandescent and arc lights for the city. The generating machinery consists of two 120-kilowatt, double-current generators from the Westinghouse Electric & Manufacturing Company of Pittsburgh. The boilers are of the Babcock & Wilcox type. The special point about the generators is that they produce direct current at 550 volts for use of the cars and at the same time alternating current for the electric lighting.

### More Power From Niagara.

The Canadian Niagara Power Company has just let a contract for three turbines, each of 10,000 h.p., the largest in the world. The company is sinking a wheel pit in Victoria Free Park, only a short distance back from the brink of the Horseshoe. This pit will be 170 ft. deep and 480 ft. long and 21 ft. wide. From the wheel-pit to the lower river a tunnel 2,200 ft. long has been driven through solid rock. This tunnel is 25 ft. high and 18 ft. wide, 4 ft. higher than the tunnel on the American side.

### Omaha Shops of the C., St. P., M. & O.

Since last April work has been going on fast on the new shops of the Chicago, St. Paul, Minneapolis & Omaha at Omaha, Neb. When finished these shops will have cost about $400,000 and will do repair work. The buildings include: Engine house, 82 ft. deep by 375 ft. around the circle; power house, 60 by 116 ft.; machine and paint shop, 120 by 248 ft.; boiler and blacksmith shop, 80 by 243 ft.; store house, 165 by 60 ft.; water tank, coal chute and pit. Of these buildings the 15 stall engine house is about finished, and the boiler house is ready to receive boilers and engines. The smokestack will be 125 ft. high. All the buildings will be lighted by electricity. There will be 45 2,000-candle power arc lights and 207 32-candle power incandescents. Each machine will have its motor. The heating apparatus will be the Sturtevant system. The work is being done under the direction of D. C. Morgan, Chief Engineer.

### The Chicago Twenty-Hour Trains.

Mr. Daniels, the General Passenger Agent of the New York Central, says that the Twentieth Century Limited, of that road, which was put in service June 15, last, has been a success from the time the first train ran. He thinks that it has been the means of quickening trains all over the west, northwest and southwest.

### The Khabarovsk-Sretensk Railroad.

Consul-General Holloway reports to the Government from St. Petersburg that the extension of the Trans-Siberian line from Khabarovsk to Sretensk has been completed from the first-mentioned terminus to Mikhailovo-Semenovskaya, 149 miles. The most difficult part of the enterprise—the crossing of the Khingan mountain range—will now be commenced, and will give considerable trouble to the engineers. In order to hasten the completion of the whole line, which will be 746 miles long, the work between Sretensk and Pokrova, from which place the track will run direct to Blagovestchensk, will be immediately begun. The cost of the new Khabarovsk-Sretensk road is estimated at about $4,789,500, but that figure, it is claimed, will be largely exceeded in consequence of the difficulties which will be encountered in the Khingan range.

### Per Diem in Operation.

At the recent meeting of the Railway Transportation Association a member said:

"I find that our division officers, superintendents, trainmasters, agents and yardmasters have lived so long under the mileage plan of handling cars, that they have not yet awakened to the fact that they are paying so much per car per day, that time is a factor. Our management consented the other day to permit me to put four or five traveling car men on our own lines, assigned to certain divisions, where they stay, and they are carried on my roll, and report to me. These men canvass a certain district, and check up the delay of cars, foreign as well as our own; it is to our interest to do it. And the important matters that they find they wire immediately to the superintendent or the designated official of that division. In the evening they send me a carbon of such telegrams or of such letters as they write, calling attention to cars light loaded or company material delayed. When they find them they go to the agent, and say, 'Show me your notice to the roadmaster,' and they take the date the roadmaster was notified, and send it to me to see why he didn't release the cars. They find cars without consignees over the car service limit, and they ask for the report to the car service manager and see that he is keeping them up. They see that cars are properly loaded and have a reasonable amount of freight, and make suggestions as to where they can put two cars L. C. L. into one car and save a car. They take the foreign cars, the carding on which show they have been on the road 20 days, and get the home card on it to prevent the penalty being applied, and do everything possible in order to guard against delay to foreign cars and our own, which is the object of our office—to get the maximum service out of cars. We have found the first week that these men have earned a great deal more than their salary for the month. It is not what they earn now, from a per diem standpoint, but for taking care of the business; that is what they have to look out for; that has necessarily been brought out by per diem, and the desire of the management to take care of the business on our line."

We understand that one railroad handling large quantities of bituminous coal established such a method of supervision over coal traffic three or four years ago, with gratifying results. Certain other roads established a supervision of this character on each division in the spring, when per diem was being agitated. We have yet to learn of a single instance where supervision and inspection of this character has not shown gratifying results. Sooner or later it may be necessary to create the position of Division Car Service Agent, who will be the joint representative of the division operating department and the general transportation or car service department.—*Railway Equipment Register.*

### Engineer Titles in Cuba.

The United States Minister at Havana says that the order (March 18, 1902) authorizing engineers with foreign titles to exercise their profession, serve in public office, and fulfill official commissions, upon presentation of said titles to the Department of Public Instruction, is repealed. The authorization granted to engineers, mentioned in that order, as well as those subsequently granted by the Department of Public Instruction, remain in force. According to the order of June 23, 1899, and modifications on Dec. 5, 1900, engineers having titles issued by foreign universities will be admitted on their incorporation in the University of Havana, provided their titles fulfill the requirements. The incorporation of titles shall be effected in the form established for the school of sciences, the examinations being upon matters studied in the school of engineers. Cubans holding titles as engineers, issued prior to this law by foreign schools of

recognized fame and reputation, may, on presentation of said titles to the Department of Public Instruction, exercise their profession without examination. Professional men holding foreign titles, who have not previously revalidated them, shall not exercise their professions, or discharge any professional duty—national, provincial, or municipal—dating from the promulgation of this law (Oct. 28, 1902). The engineers above referred to are alone excepted.

### Traffic Through Canals at Sault Ste. Marie, November, 1902.

Eastbound.—Copper, net tons, 16,392; grain, bushels, 10,374,212; flour, barrels, 1,272,878; iron ore, net tons, 2,442,315; iron, pig, net tons, 1,516; lumber, M. ft. B. M., 117,880; wheat, bushels, 15,328,473. Westbound.—Coal, hard, net tons, 136,533; coal, soft, net tons, 405,232; manufactured iron, net tons, 22,676; salt, barrels, 60,187; general merchandise, net tons, 90,745. Freight.—Eastbound, net tons, 3,456,418; westbound, net tons, 667,620; total freight, net tons, 4,133,038. Vessel passages, number, 2,263; registered tonnage, net tons, 3,605,166.

### A Disastrous Explosion.

On the morning of Dec. 3, at the wharf of the Fulton Iron Works, San Francisco, Cal., an explosion occurred on board the steamship "Progresso" which killed or injured 30 sailors and workmen. The vessel was being changed from a coal burning collier to an oil burning tank ship to be used in the Galveston oil trade. Fourteen tanks containing about 400 barrels of oil were on board at the time and these took fire, several minor explosions followed and the burning oil was scattered over the adjacent docks, which took fire, causing a loss to the shipyard of more than $20,000. The "Progresso" was formerly called the "Falls City," and has a tonnage of 1,920 gross tons. The general manager of the Fulton Iron Works is positive that the explosion was due to the gas generated in the oil tanks and not to the boilers.

### Public Improvements at Hawaii.

Estimates prepared by Mr. Henry E. Shaw, Secretary of the Territory of Hawaii, have been sent to Congress by the Secretary of the Treasury. These estimates include $767,000 for a federal building in Hilo; $150,000 for a site for a building at Honolulu; $150,000 for a lighthouse tender; $250,000 for a revenue cutter; $250,000 for dredging and improvements in Honolulu harbor, and $500,000 for a breakwater and other improvements in Hilo harbor.

### The Proposed Department of Commerce.

A committee consisting of Assistant Secretary Ailes, of the Treasury Department; Assistant Secretary Ryan, of the Interior Department; Mr. John Hyde, Chief Statistician of the Department of Agriculture, and a representative of the State Department has been appointed by the President to confer about the transfer of various bureaus from the departments named to the proposed Department of Commerce. This committee and a subcommittee of the House of Representatives began conferences on the bill last week at Washington. It will be remembered that the bill creating the new department was passed by the U. S. Senate last winter and is now before the House Committee on Interstate and Foreign Commerce.

### A Strip Ticket Patent Decision.

In the suit of Pugh v. the Pittsburgh, Cincinnati, Chicago & St. Louis Railway Company, for alleged infringement of Patent No. 314,170, granted March 17, 1885, to John P. Eastman, of Chicago, the alleged infringing device being the continuous strip mileage ticket in use by the railroad companies composing the Central Passenger Association, and others, the Circuit Court of the United States at Cincinnati, on Dec. 4, held that there was no infringement of the Eastman patent, and dismissed Pugh's bill.

### Some British Opinions of American Railroads.

Mr. Wilson Worsdell, Locomotive Superintendent of the North Eastern Railway, lecturing at Gateshead concerning the recent tour of North Eastern Railway officials in the United States, said they were not cursed in America by a Board of Trade, and were able to do such things as fly-shunting express trains—letting them run loose into a station and bringing them up by means of the Westinghouse brake. Without such a free hand he was convinced that they could not work their traffic in places like New York. One thing that astonished him was the steadiness of the running on American lines—one reason, he thought, being the elastic lines. He would like to see English lines made in the same way, and he believed they would get more mileage out of their locomotives. Referring to American locomotives, he said there was a great advantage across the water, as they could go to a gage of 10 ft. 6 in., as compared with 8 ft. 6 in. in England, and a height of 16 ft., compared with 13 ft., which gave them the opportunity of building much more powerful engines. He added that in America they required all their officials to be mechanical engineers. On one run, from Buffalo to Jersey City (447 miles), there were no signal cabins, the whole block system being automatically worked. The system was quite safe, and was spreading all over the States, and one did not know what might be in the future for this country. Describing Boston Station, he said that, with 775 trains in and the same number out each day, it was worked by one signal cabin with seven men by means of the pneumatic system now in use on the North Eastern Railway at Tyne Dock. At the end of their visit they visited some lines in Connecticut, and saw local lines which were originally steam-worked and ran four trains a day at a loss, now, after electrification, running 14 cars a day at a profit. That largely accounted for the decision of the directors of the North Eastern Railway Company to "electrify" their local lines, though even there the Americans had an advantage in not having to protect the third, or "live" rail as the North Eastern would have to do. He believed the future of the local lines in all parts of the country, where they had to compete with tramways, would be electrification.

### The Proposed Union Station at Washington.

The Committee on the District of Columbia of the House of Representatives last week receded from the position it took last spring in favor of the C street site for the proposed Union station at Washington, D. C. After an inspection of both the C street and Massachusetts avenue sites, and a hearing at which President Loree, of the Baltimore & Ohio, and Vice-President Rea, of the Pennsylvania, appeared and were heard in favor of the Senate bill, the Committee decided to unanimously report in favor of the bill as passed by the U. S. Senate last winter, which provides for the building of a Union passenger station on Massachusetts avenue, not far from the present Baltimore & Ohio station. The Committee also agreed to cut down the amounts to be paid by the Government and by the District of Columbia from $1,500,000 to each road to $1,000,000 to each road. A sub-committee was appointed to perfect Section 11 of the bill to make sure that other roads entering the city shall have the right to use the Union station. As the bill now stands, having been passed by the Senate and favorably reported upon by the House Committee, it provides for a Union station monumental in character, eliminates grade crossings, removes the Pennsylvania Railroad from the Mall, leaving it free for park purposes, and greatly increases the railroad facilities at Washington, the site agreed upon being favored by the railroads and by the Commissioners of the District of Columbia.

### An Aspect of "Big Waggons."

A British mechanical engineer writing to *The Statist* says: "It does not require much prophetic insight to foretell that automatic couplers and continuous brakes will be required for freight trains of the future; a railway which decides to rest content with 12-ton waggons will pay three times as much for its equipment of this character as will suffice for an equal capacity of 40-ton waggons."

## LOCOMOTIVE BUILDING.

*The Alabama Great Southern* is having four locomotives built at the Baldwin Works.

*The Chicago, Burlington & Quincy* is having 25 locomotives built at the Baldwin Works.

*The Grand Trunk*, according to press reports, has placed orders in Scotland and England for material, and will build 25 locomotives at its Point St. Charles Works.

*The New York, New Haven & Hartford* is having 15 locomotives built at the Rhode Island Works of the American Locomotive Co., in addition to the order reported in our issue of Aug. 15.

*The New York, Chicago & St. Louis* has ordered 15 simple consolidation locomotives from the American Locomotive Co., for September, 1903, delivery. These locomotives will weigh 160,000 lbs., with 142,000 lbs. on the drivers, and have 19 x 28 in. cylinders, 62 in. drivers; radial stay boilers, with a working steam pressure of 200 lbs.; 306 charcoal iron tubes, 2 in. in diameter, 14 ft. 9¾ in. long; fire-box 96 in. long and 63 in. wide; tank capacity, 5,500 gallons of water and 14 tons of coal. The special equipment includes: Westinghouse air-brakes, Tower couplers, Star headlights, Monitor injectors, U. S. piston rod packings, Leach sanding devices, Nathan sight-feed lubricators and Crosby steam gages.

*The Pittsburgh & Lake Erie* writes that 40 locomotives have been ordered from the American Locomotive Co. for 1903 delivery, and that no other orders for locomotives of this type will be placed by them during the ensuing year. These engines are simple consolidations, weighing about 170,000 lbs. on drivers; total weight, 192,000 lbs.; cylinders, 21 x 30 in.; diameter of drivers, 51 in.; straight boilers, with working pressure of 200 lbs., and 402 iron tubes, 2 in. in diameter, and 14 ft. 9 in. long; dimensions of fire-box, 108 x 68 in., to be built of carbon steel. Tank capacity for water, 7,000 gallons; coal capacity, 10 tons. Special equipment includes Westinghouse air-brakes, steel axles, Gould couplers, Monitor injectors, U. S. piston rod and valve rod packings, Coale safety valves, Economy sanding devices, Nathan sight feed lubricators and Latrobe driving wheel, truck wheel and tender wheel tires.

## CAR BUILDING.

*The Wabash* is reported about ready to order approximately 50 coaches.

*The Boston & Maine* is having 300 freights built at the Laconia Car Works.

*The Mobile, Jackson & Kansas City* is in the market for 100 cars of 80,000 lbs. capacity.

*The American Car & Foundry Co.* has miscellaneous orders for 182 cars of various types.

*The Belington & Beaver Creek* has ordered 300 freights from the American Car & Foundry Co.

*The New York Coal & Transportation Co.* is having 50 freights built at the Pressed Steel Car Works.

*The Lake Erie, Alliance & Wheeling* has ordered 500 hopper and gondola cars from the Pullman Works.

*The Chicago, Burlington & Quincy* is reported to have ordered 90 coaches from the American Car & Foundry Co.

*The Coal & Coke Co. (W. Va.)* is having 50 freights built at the South Baltimore Car Works, in addition to orders reported in our issue of Sept. 19, and Nov. 14.

*The Wisconsin & Michigan*, according to press reports, is building 100 36-ft. flat cars at its Peshtigo shop, and it is said that 100 box cars will be built there after the present order is completed.

*The Berwind-White Coal Mining Co.* has ordered 200 coal cars of 80,000 lbs. capacity from M. H. Treadwell & Co., successors to the Lebanon Mfg. Co., Lebanon, Pa. These are for January, February and March, 1903, delivery.

*The St. Louis & San Francisco*, as reported in our issue of Dec. 5, has ordered 1,000 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., for February, 1903, delivery. The special equipment includes: American Steel Foundries' cast steel bolsters, Sterlingworth brake-beams, Spiral brasses, Trojan couplers and Scott springs.

*The Atchison, Topeka & Santa Fe* has specifications out for stock cars of 60,000 lbs. capacity. Weight of car, 32,000 lbs.; length, 36 ft., inside measurement; width, 8 ft. 8 in., inside measurement; height, 7 ft., to be built of wood with wooden underframes. Special equipment includes M. C. B. axles, brake-shoes and brasses; cast steel bolsters, Westinghouse brakes, M. C. B. couplers, Miner draft rigging and M. C. B. malleable iron journal boxes and journal box lids.

*The Seaboard Air Line*, as reported in our issue of Nov. 28, is asking bids on 1,000 box cars of 60,000 lbs. capacity. Length, 36 ft. 9¾ in. over end sills; width, 9 ft. over side sills; height, 11 ft. 11½ in. to eaves; to be built of wood with wooden underframes. Special equipment includes wrought iron or steel axles, 6-in. I-beam body bolsters; 9-in. I-beam truck bolsters with oak filler; Standard cast-iron brake-shoes, Westinghouse brakes, Ajax brasses, Tower couplers, Jones doors, Street draft rigging, basswood dust guards, McCord journal boxes, Chicago inside roofs, coil springs and Diamond arch bar trucks.

*The Delaware, Lackawanna & Western* is reported to have ordered 1,000 box cars and 500 steel cars from the American Car & Foundry Co.; 500 steel cars from the Standard Steel Car Co., and 500 cars from the Pressed Steel Car Co. One thousand box cars have also been ordered from the Barney & Smith Works. The box cars ordered from the American Car & Foundry Co. will be built at the Berwick Works for March, 1903, delivery, and will be of 60,000 lbs. capacity, 36 ft. long, 8 ft. 6 in. wide, and 8 ft. high, of wood with metal underframes. The Barney & Smith cars will be delivered at the same time and have similar specifications. Special equipment for both orders includes steel axles, Westinghouse brakes, Magnus metal brasses, combined steel draft rigging and underframes, Symington dust guards and journal boxes, arch bar trucks, with Barber roller bearings, and cast wheels.

*The Missouri, Kansas & Texas*, as reported in our issue of Dec. 5, has ordered 50 excursion passenger cars from the American Car & Foundry Co. The cars will weigh 88,000 lbs., and measure 62 ft. 5 in. long over end sills, 9 ft. 8 in. wide over side sills and 14 ft. 6 in. high from top at track to top of roof, with wooden underframes. The special equipment will include: M. C. B. 5 x 9 in. axles; American Car & Foundry Co.'s bolsters; National-Hollow 2½ in. brake-beams; Diamond "S" brake-shoes; Westinghouse air-brakes; M. C. B. 5 x 9 in. lead lined brasses; Janney No. 360 couplers; Passenger standard door fastenings and doors; American Car & Foundry Co.'s draft rigging; American Car & Foundry Co.'s standard dust guards; Safety Car Heating & Lighting Co.'s steam heating system; M. C. B. 5 x 9 in. cast-iron journal boxes; M. C. B. malleable iron journal box lids; Acme oil lamp lights; Railway Co.'s standard paint; American Car & Foundry Co.'s standard steel platforms; passenger standard roofs; American Car & Foundry Co.'s reversible rattan covered seats; Railway Co.'s standard springs; American Car & Foundry Co.'s M. C. B. 5 x 9 in. four-wheel trucks, with inside hung brakes; open platform 30 in. vestibules and 33 in. cast-iron American Car & Foundry Co.'s wheels.

## BRIDGE BUILDING.

ABBOTSFORD, WIS.—The city has voted to build a bridge across the Prairie River at First street.

ALBANY, N. Y.—It is said plans are being made for crossings under the tracks of the New York Central at the Union Station.

ALLEGHENY, PA.—The courts will soon decide whether the city or the county shall pay for the bridge which is proposed between the Sixth and Tenth Wards at Allan or Tilghman streets.

AMHERST, VA.—Bids are wanted Jan. 6 by A. E. Strode, County Commissioner, for a bridge over Harris Creek.

AMOS, MO.—Bids are wanted Dec. 18 by James M. Clock at Nevada, Mo., for a bridge at Amos.

AUGUSTA, GA.—A bill has been introduced in Congress providing for a bridge over the river at Sand Bar Ferry, four miles below Augusta.

BALTIMORE, MD.—A local report says that because the Western Maryland Railroad Company intends to construct a bridge across Spring Gardens, it is now proposed to do away with what is known as Long Bridge connecting Ferry Bar with the Brooklyn and Curtis Bay sections of Anne Arundel County. City Engineer Benjamin T. Fendall and Harbor Commissioner N. H. Hutton have been appointed a committee to represent the city in the matter. The present bridge is about one mile long, and is also known as the Light street bridge.

The Allegheny County Commissioners want bids Jan. 5 for about five steel bridges of various sizes.

BARRIE, ONT.—The County Council has instructed R. H. Gibson to prepare plans for the North River bridge.

BERRYVILLE, VA.—Plans, with specifications, etc., are wanted from engineers for the proposed bridges at Castleman's and Berry ferries, for which $40,000 is available. S. M. Cormick, Deputy Clerk.

BOSTON, MASS.—The contract for building the Wellington bridge, which will take the place of the Middlesex avenue bridge between Somerville and Medford, has been let to Jones & Meehan, of Boston, at $86,000.

BRIDGEPORT, W. VA.—Clerk F. S. Rice is advertising for bids for the proposed new West End bridge. It will cost about $22,000.

BLOOMFIELD, IND.—Bids are wanted Jan. 6 for a 100 ft. and a 40 ft. steel bridge. Harvey L. Doney, Auditor.

CHICAGO, ILL.—Bids are wanted until Dec. 15 by the Commissioner of Public Works for building the substructure of the new North Western avenue bridge over the North Branch of the Chicago River. F. W. Blocki, Commissioner.

COLLINGWOOD, ONT.—The Roads & Bridges Committee of the County Council has recommended that a new structure be built to replace Wasdell bridge over the Severn River.

CONNELLSVILLE, PA.—The new Pennsylvania, Monongahela & Southern R. R. will build bridges over Tenmile Creek, Muddy Creek and Little Whitely Creek. It is to be a part of the Wabash System.

CRESCENT CITY, CAL.—A bridge is proposed over Illinois River and C. F. Loveland, according to report, with others, will select the site.

HARRISBURG, PA.—The report of viewers recommending a steel truss bridge over the Schuylkill River at Shollenberger's Crossing, Schuylkill County, to replace the present wooden structure, has been filed at Harrisburg.

HILLSBORO, TEXAS.—A bridge will be built where the new Trinity & Brazos Valley R. R. will cross the Missouri, Kansas & Texas.

HINCKLEY, MINN.—It is said that bids are wanted for a 200-ft. steel bridge across Kettle River.

KANSAS CITY, MO.—The indications are that the new owners of the Union Depot, Bridge & Terminal Co. are preparing to carry out the project at once. It is said that the Kansas City end of the proposed bridge, which is the old Winner bridge, will be near Holmes street. It is also said that the Swift and Armour Packing Companies are interested.

The Board of Public Works is considering repairs to the Fourth, Bluff and Lincoln street viaducts. There is some money available for this work, but it is not sufficient.

LUVERNE, ALA.—The State Railroad Commissioners are considering the order of this city to have the Atlantic Coast Line build bridges at certain streets.

MCKEES ROCKS, PA.—A bridge is proposed over Chartiers Creek to connect with Esplen and Sheridan boroughs. David K. McGunnegle is interested.

MIDDLETOWN, PA.—There is talk of an electric railroad company building a bridge over the Susquehanna at this point.

MILES CITY, MONT.—Address George Schutz, this place, about the 120-ft. steel bridge over Glendive Creek at Glendive.

MONTEZUMA, IOWA.—It is said the County Auditor wants bids Jan. 5 for all the bridges needed in his county during next year.

NEW BRIGHTON, PA.—Application will be made on Dec. 12 for the incorporation of a company which proposes to build a bridge from Sixth avenue, Beaver Falls, to Seventh avenue, New Brighton. W. A. Park and Richard Holt are interested.

NEW HOPE, CAL.—Bids are wanted Jan. 6 by the Clerk of either Sacramento and San Joaquin counties, for the steel drawbridge over Mokelumne River. The draw will be 209 ft., with 38 ft. of steel approach. The estimate is $20,000. F. E. Quail, County Surveyor, Stockton.

NEW YORK, N. Y.—The contract for the steel for the bridge to be built over Hell Gate by the New York Connecting Railroad has been let provisionally to the Pennsylvania Steel Co. The structure, which is to be a cantilever of over 500 ft., was described in the *Railroad Gazette* when the plans for a road to connect the New York, New Haven & Hartford and the Pennsylvania railroads through Long Island were announced.

NORTH CRANDON, WIS.—It is said the County Commissioners will soon want bids for a number of bridges in various parts of the county.

OKLAHOMA CITY, IND. T.—The Texas & Oklahoma R. R. will soon let contracts for three bridges. F. W. Fratt, Chief Engineer. (See R. R. Construction).

OREGON.—The Oregon Railroad & Navigation Co. will put in 40 steel bridges during 1903.

OSHKOSH, WIS.—Erickson & Lehman have submitted plans to the Common Council for the proposed steel bridge across Sawyer Creek. The cost will be $6,000.

OTTAWA, ONT.—The Minister of Railways and Canals is having plans prepared for a steel bridge across the Rideau Canal at the foot of Concession street.

PHILADELPHIA, PA.—An ordinance is before the Councils authorizing the Pennsylvania R. R. to cross Spring Garden, Market, Chestnut, Walnut and South streets with its proposed elevated freight tracks extending from the 34th street bridge to a point below the South street bridge.

PIERZ, MINN.—It is said a bridge will be built across the Platte River at this place.

PORTLAND, IND.—The County Auditor wants bids Dec. 18 for a bridge over Salamonia River. It will be 120 ft. long.

PULASKI, PA.—The court has empowered the State Board of Public Grounds and Buildings to build the proposed bridge over the Shenango River at Pulaski, Lawrence County. The viewers had recommended a stone bridge but the Board objected to this as being too expensive.

READING, PA.—There is an ordinance under consideration authorizing the expenditure of $55,000 for a bridge at Spring street over the Philadelphia & Reading R. R.

SAGINAW, MICH.—The lowest bid submitted on Nov. 26 for the two-span bridge over Cass River was by the American Bridge Co., its bid being $19,800. It is probable that new bids will be asked.

ST. JOSEPH, MO.—General Manager Du Puy, of the St. Joseph & Grand Island, is reported as saying that estimates and specifications are being made for rebuilding the Grand Island bridge across the Missouri River at St. Joseph.

ST. LOUIS, MO.—Instead of building a viaduct across the Union Station shed from 18th to 20th streets, the Terminal Association has decided to build a subway beneath the station. It will be 100 ft. wide and 14 ft. high, and work has been begun.

SAN ANTONIO, TEXAS.—A viaduct will probably be built on Duval street at Walnut by the railroad seeking right of way on that thoroughfare.

SAN FRANCISCO, CAL.—It is said the Southern Pacific Co. will build a steel bridge over the Guadalupe River.

SENECA FALLS, N. Y.—Issues of some $20,000 of bridge bonds were voted on favorably recently.

TOWANDA, PA.—The Court has approved the report of the Grand Jury recommending a bridge over the Susquehanna River at Sayre. It is said bids will be wanted within a few weeks.

WASHINGTON, D. C.—The Secretary of War has asked Mr. Burnham, of Chicago, to go to Washington to confer with General Gillespie and the army engineers in regard to the plans for the proposed highway bridge across the Potomac River.

WATERLOO, IOWA.—The Illinois Central, according to report, will bridge the Cedar River here.

WHEELING, W. VA.—An inspection of all the bridges and buildings on the Baltimore & Ohio System is now being made preparatory to arranging for next year's work.

WORCESTER, MASS.—The Boston & Albany has submitted plans to the Grade Crossing Commission to eliminate the crossings in Worcester, and in addition, has made plans for a new passenger station to be built in connection with this work.

YORK, PA.—The County Commissioners have approved the recommendation for a new bridge over the Codorus Creek at Richland avenue.

### Other Structures.

ALBANY, N. Y.—The barns of the Cohoes City Railway Co., owned by the United Traction Co. of this city, were burned Dec. 8. Twelve trolley cars were destroyed.

ALLEGHENY, PA.—Plans are being made by the Pennsylvania R. R., according to report, for a new union station to be built in Federal street, Allegheny. It is proposed to have all the railroads terminating in Allegheny use the station, the location for which is Federal street, Church avenue and Sandusky street.

ANNISTON, ALA.—The Louisville & Nashville is preparing to rebuild the shops and roundhouse here.

ATLANTA, GA.—Application has been made for the incorporation of the Atlanta Terminal Co., which will build the proposed union station in that city. It is said the new building will cost $600,000.

BALTIMORE, MD.—The Pennsylvania R. R. contemplates the erection of a new passenger station in Baltimore. The structure will be in Belaire avenue, near Preston street, and will cost about $25,000.

BOSTON, MASS.—The bidders on the work to build the new shop for the Department of Steam Engineering at the Charlestown Navy Yard were as follows: Norcross Bros., Boston, $101,500; L. L. Leach & Son, Chicago, $102,000; Dodge Construction Company, Boston, $103,000; Penn Bridge Company, Beaver Falls, Pa., $108,000.

The New York, New Haven & Hartford has recently bought 20 acres of ground on the Commonwealth Flats, South Boston, upon which it is said extensive freight terminals will be built.

CLEVELAND, OHIO.—The Pennsylvania Co. has finished plans for the new roundhouse to be built in its Kinsman street yards. This is only part of the extensive improvements to be carried on there.

CONNELLSVILLE, PA.—The Sligo Iron & Steel Co. proposes to remove its mills to Connellsville. The new location is on the Pennsylvania and Baltimore & Ohio Railroads.

GASTONIA, N. C.—The Carolina & Northwestern R. R. will remove its shops from Chester, S. C., to Gastonia.

HOMESTEAD, PA.—The Pennsylvania has an ordinance before the local councils for permission to lay additional tracks and build a new freight depot and passenger station.

LATROBE, PA.—Bids have been asked for a new passenger station on the Pennsylvania R. R. at Latrobe. It will cost approximately $30,000.

LEDWICK, PA.—The plant of the Greensburg Foundry & Machine Co. has been entirely destroyed by fire.

LOUISVILLE, KY.—The L. & N. will build a passenger station on Baxter street in the spring. The plans are made.

MCKEES ROCKS, PA.—The contract for building the superstructure of the new erecting and machine shop and the power house for the Pittsburgh & Lake Erie at its new McKees Rocks yards has been let to W. E. Trimble & Sons. The erecting shop will be 560 ft. long and 170 ft. wide, and of brick and steel construction. The steel work was to be supplied by McClintick & Marshall. The Trimble contract amounts to about $150,000. All of the machinery will be supplied with a variable electric motor. The erecting side of the big shop includes 24 stalls. Following are some general dimensions: Boiler and tank shop, 275 x 100 ft.; storehouse, 100 x 75 ft.; freight car shop, 650 x 150 ft.; blacksmith shop, 200 x 74 ft.; coach shop and planing mill, 300 x 120 ft.; paint shop, 203 ft. 2 in. by 85 ft.; power house, 100 x 77 ft.

MITCHELL, ILL.—An officer of the Cleveland, Cincinnati, Chicago & St. Louis writes that he knows nothing in regard to the report that shops for the Big Four will be built at Mitchell.

MONCTON, N. B.—Bids are wanted by D. Pottinger, General Manager of the Intercolonial, until Dec. 18 for building the extension to the car shop.

NEWARK, N. J.—The Central R. R. of New Jersey has decided to build a new station at its Broad street terminal. The frontage will be 100 ft. on Broad street, and it will be about 840 ft. deep.

NEW BRUNSWICK, N. J.—The J. S. Rogers Co., of Moorestown, has the contract to build the new Pennsylvania R. R. station at New Brunswick.

PETERSBURG, VA.—The contract for the new freight station to be built in this city by the Atlantic Coast Line has been let to Geo. W. Lambert, of Richmond. The structure will be 376 x 60 ft.

ST. JOHN, N. B.—It is reported that new bids will be wanted on the Intercolonial roundhouse in this city, as Rhodes, Curry & Co., of Amherst, have surrendered their contract which agreed to build the roundhouse for $60,000.

ST. PAUL, MINN.—The Northern Pacific is planning some extensive improvements at its St. Paul terminals.

SANDTS EDDY, PA.—The Quaker Portland Cement Company, New York, will build here a cement mill, to have a daily capacity of 4,000 barrels. The company wants information about labor saving devices and improved machinery.

SAN FRANCISCO, CAL.—Plans for the new ferry building of the San Francisco & Piedmont Railway & Ferry Company have been completed and submitted to contractors for bids. Construction will be pushed as soon as the bids are approved, it being the intention to have the new ferry in operation by the opening of next summer. The plans provide for a train-shed 65 x 358, and waiting room 90 x 144, equipped with every improvement and convenience devised for structures of this kind.

TRINIDAD, COLO.—The Atchison, Topeka & Santa Fe is building a new passenger station here at a cost of $80,000.

WINNIPEG, MAN.—The Canadian Pacific is having plans made for new shops to be built in Winnipeg next spring.

WORCESTER, MASS.—The Boston & Albany has plans made for a new union station to be built here after the tracks are elevated.

## MEETINGS AND ANNOUNCEMENTS.

*(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)*

### Iowa Railway Club.

The proceedings of the May, June and October meetings have just been published in pamphlet form with a list of the members of the club. P. B. Vermillion, Union Station, Des Moines, Iowa, is Secretary.

### Canadian Railway Club.

Mr. Gus. Giroux, Mechanical Inspector on the Canadian Pacific, read a paper on "Piece Work," on Nov. 30. Hereafter the meetings of the club will be held at the Windsor Hotel, Montreal, on the first Tuesday of each month at 8 p.m., excepting June, July and August.

### Richmond Railroad Club.

At the meeting held Thursday, Dec. 11, at 8:30 p.m., the subject for discussion, "Inspection of Locomotive Equipment and Building Shops from a Builder's and a Railroad Inspector's Standpoint," was introduced by Mr. H. A. Gillis, of the American Locomotive Works, for the builders, and Mr. R. H. Rogers, of the B. & O. R. R., for the inspectors.

### Railroad Trackmen's Brotherhood.

The Brotherhood of Railway Trackmen met in St. Louis, Mo., on Dec. 3, and elected officers as follows: President, John T. Wilson, St. Louis; Vice-President, J. W. Davenport, Sandifer, N. C.; Secretary and Treasurer, C. Boyle, St. Louis; Executive Committee, J. C. Lambert, Jasper, Ala.; S. E. Hawes, Bath, Ga.; J. S. Eastman, Vermont; R. F. Ferguson, Port Arthur, Ont.

### Western Railway Club.

The subjects for the December meeting of this Club, which will be held on Tuesday, Dec. 16, were given in our issue of Nov. 28. As was mentioned at that time, it is expected to make this a more than usually attractive meeting. The lecture by Dr. von Schrenk on "Timber Preservation" will be of especial interest to officers and engineers and should induce a good attendance. The two papers to be presented are on topics of considerable importance and will doubtless provoke considerable discussion.

### The Car Foremen's Association of Chicago.

The regular meeting of the Car Foremen's Association of Chicago was held in Room 209, Masonic Temple, Chicago, Wednesday, Dec. 10, at 8 o'clock p. m. The programme follows:

1. Defective railroad crossing and injury they cause to car equipment.
2. A's car is destroyed on B's road. Body of car is stenciled 65,000 lbs. Trucks are not stenciled for capacity, but are equipped with M. C. B. axles with journals 4¼ x 8 in. (See Rule 110.) Should trucks be settled for as 60,000 or 80,000 lbs. capacity?
3. Continuation of discussion of the new M. C. B. Rules, beginning with Rule 83. Particular attention is directed to Rules 83, 86, 87 and 91.

### New York Railroad Club.

The next regular meeting of the club will be held at Carnegie Hall, 154 W. 57th street, New York City, Friday evening, Dec. 19. The subject for consideration will be "The Operation of the Per Diem System of Settlement for Car Hire." Papers will be presented by Mr. M. B. Casey, Superintendent Car Service, Delaware, Lackawanna & Western R. R.; Mr. W. H. Rosevear, General Car Accountant, Grand Trunk Ry., and Mr. J. R. Cavanagh, Superintendent Car Service, Big Four System. Superintendents of Car Service in this territory have been invited to attend and take part in the discussion.

### American Railway Engineering and Maintenance-of-Way Association.

The next annual convention of the American Railway Engineering and Maintenance-of-Way Association will be held in Chicago on March 17 and 18, 1903. At a meeting of the Board of Directors, held in Chicago on Dec. 4, the following nominations for officers for 1903 were made: President, Hunter McDonald, Chief Engineer, N. C. & St. L. Ry., Nashville, Tenn.; First Vice-President, H. G. Kelley, Chief Engineer, Minn. & St. Louis Railway, Minneapolis, Minn.; two Directors to serve three years, A. W. Sullivan, James Dun; Treasurer, W. S. Dawley, Chief Engineer, C. & E. I. R. R., Chicago; Secretary, L. C. Fritch, Chicago, Ill.

The Committee of Arrangements selected is as follows: T. L. Condon, Chicago, Chairman; H. F. Baldwin and J. B. Cox.

L. C. Fritch, B. & O. S.-W. R. R., Secretary, Chicago, Ill.

## PERSONAL.

—Mr. William H. Tillinghast, a director of the Delaware & Hudson Company, died Dec. 9, at his home in New York City, aged 77 years.

—Mr. E. E. Loomis, Vice-President of the Delaware, Lackawanna & Western, and Miss Julia O. Langdon were married at the home of the bride's parents at Elmira, N. Y., Nov. 28.

—Mr. W. H. Purdy, former Commissioner of Public Works of the city of Chicago, died recently in Baltimore, Md. Mr. Purdy was formerly connected with the mechanical department of the Illinois Central Railroad.

—Mr. A. C. Barney, of Washington, D. C., died at Monte Carlo, Saturday, Dec. 6. Mr. Barney was a member of the firm of Barney & Smith, car manufacturers, of Dayton, Ohio, but had not engaged in active business for some years.

—Mr. W. Kendrick Hatt, Professor Applied Mechanics of Purdue University, has been granted leave of absence for the remainder of the academic year and will resume his duties Sept. 1, 1903. During this interval he will be connected with the Road Material Laboratory, Bureau of Chemistry, United States Department of Agriculture, Washington, D. C.

—Mr. Everett E. Stone, Assistant Chief Engineer of the Boston & Albany, has just been elected Mayor of the city of Springfield, Mass. Mr. Stone was born in 1865, and educated at Worcester Academy. He has been connected with the Boston & Albany since 1887, having started as a surveyor. He was subsequently made Assistant Division Roadmaster, Division Roadmaster, and was finally promoted to the position he now holds. Mr. Stone has, we believe, served a number of years as Alderman.

—Mr. A. C. Hutchinson, President of Morgan's Louisiana & Texas Railroad & Steamship Company, died at New Orleans, Dec. 7, aged 70 years. Mr. Hutchinson was born in Brooklyn, N. Y., and as a boy worked in the shipyard there. In 1867 he was elected a Director of the New Orleans, Opelousas & Great Western, and two years later was appointed Manager of the company he was with at the time of his death. For five years (1882-1887) he was President of the Houston & Texas Central and was also, until 1889, General Manager of the Atlantic System of the Southern Pacific.

—Mr. Charles H. Dow, senior partner of the firm of Dow, Jones & Co., died last week at his home in Brooklyn, N. Y. He was the founder of *The Wall Street Journal*, and of the financial news service rendered by that firm. For many years he was editor-in-chief of the *Journal*. He was born in Connecticut in 1851. When he was six years old his father died, and really his work in the world began then. His energy, his intelligence, and, above all, his integrity, won for him a great success and built up a daily financial newspaper which has a place by itself, when that place is measured by ability and honesty.

—Sir William Chandler Roberts-Austen, K.C.B., died at the Royal Mint on Saturday, Nov. 22. He was a

great metallurgist, and his death at the comparatively early age of 59 is a serious loss to the world, for he was a man of much physical and intellectual vigor and was good for years of hard work. He had served as President of the British Iron & Steel Institute, was an honorary member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers, was Honorary Secretary of the British Association for the Advancement of Science, a Fellow of the Royal Society and had received honors from many countries besides his own.

—Mr. James C. Clarke, who in 1895 was President of the Mobile & Ohio Railroad, died at the home of his daughter in Chicago, Dec. 8. Mr. Clarke was born in 1824 and entered railroad service in 1844 with the Baltimore & Ohio, where he remained until 1854, when he resigned to go with the Central Ohio as Superintendent. The following year (1855) he went with the Illinois Central, with which company he was associated for a great many years. During that time Mr. Clarke was Vice-President and General Manager of the Erie. This was in 1872. In 1888 Mr. Clarke was elected Vice-President and General Manager of the Mobile & Ohio, and in March, 1895, assumed the Presidency, but owing to ill-health, resigned from this latter position in 1898.

—Mr. Charles F. Hillman, for many years a prominent American civil engineer in South America, died at Santiago, Chile, on June 14, last. Mr. Hillman was born in Albany, N. Y., in 1835, and was educated at the State Normal School. In 1854 he became a civil engineer for the Great Western Railway of Canada, but in 1857 he went to Chile to superintend the construction of the Ferrocarril del Sur, and had since been more or less actively interested in the important railroads built in that country. He had been a member of the American Society of Civil Engineers since 1876 and also a member of the Institution of Civil Engineers of London since 1882. Mr. Hillman was widely known in Santiago and was for a number of years Chief Engineer of the Second Section of the State Railroads Extension from Santiago to Talca. He, with Mr. Stephen Mayers, was later awarded the contract for building the two extensions of the road to the frontier. During the five years Mr. Hillman was on this work he resided at Angol.

—It is probable that Mr. Francis William Webb will shortly leave the service of the London & North Western Railway. It has been said that he has already resigned; so far as we can learn he has indicated his desire to withdraw from active life, but the date has not been fixed. Mr. Webb has a world-wide reputation as the Chief Mechanical Engineer of the London & North Western, where he has great power and influence and where he is said to be in receipt of the handsome salary of $35,000 a year. He began his work at Crewe in 1851 as a pupil in mechanical engineering, and 10 years later he became Works Manager. From 1866 to 1871 he was manager of the works of the Bolton Iron & Steel Co., and in 1871 returned to Crewe, where he has remained ever since. During his residence there the population of the town has considerably more than doubled and is now over 40,000, the people being dependent almost entirely upon the London & North Western Railway works. In this respect Crewe stands to England much as Altoona does to the United States, but the variety of product turned out at Crewe is much greater than at Altoona, for it has always been Mr. Webb's policy to manufacture everything that the railroad needs at its own works. It is said that he has built at Crewe about 4,000 locomotives, but the mills and shops under him have built a great many other things. He was prolific in his own inventions, which covered the casting of steel driving wheel centers, steel cross ties and the machines to make them, a great variety of signaling apparatus, systems of compounding locomotives, etc. It is said that there are now running on the London & North Western seven different types of compound engines. We believe that Mr. Webb never received any royalties from his company on any of his many patents. Mr. Webb was not only ingenious and fertile in mechanical matters, but he was a man of great personal force and dominated the people amongst whom he lived and worked and had served the town of Crewe as its Mayor. He is a Vice-President of the Institution of Civil Engineers.

## ELECTIONS AND APPOINTMENTS.

*Baltimore & Ohio.*—Arthur Hale, heretofore Assistant General Manager, has been appointed General Superintendent of Transportation, with headquarters at Baltimore, Md., succeeding J. C. Stuart, resigned. L. G. Haas, General Superintendent at Pittsburgh, succeeds Mr. Hale at Baltimore, and Mr. Haas in turn is succeeded by I. G. Rawn, heretofore General Superintendent of the Baltimore & Ohio Southwestern, effective Dec. 8. J. H. Tinker has been appointed Master Mechanic, with headquarters at Garrett, Ind., succeeding C. F. McDermott, resigned.

*Burlington & Missouri River in Nebraska.*—D. O. Ives has been appointed General Freight Agent, with headquarters at Omaha, succeeding Geo. H. Crosby, promoted.

*Burlington & Western.*—See Chicago, Burlington & Quincy.

*Canadian Pacific.*—F. L. Darling, heretofore Division Engineer of the Northern Pacific, has been appointed Division Engineer of Construction of the C. P., with headquarters at Montreal, Que.

*Chicago & Eastern Illinois.*—See St. Louis & San Francisco.

*Chicago, Burlington & Quincy.*—After Jan. 1 the Burlington & Western Railway will be operated as a part of the Iowa Division of the C., B. & Q., under the superintendence of H. C. Nutt, Superintendent of the Iowa Lines.

*Chicago, Milwaukee & St. Paul.*—C. F. Winn has been appointed District Master Mechanic, with headquarters at West Milwaukee, succeeding F. W. Cox, resigned. W. A. Parker has been appointed Master Car Builder, with headquarters at Minneapolis, Minn., succeeding H. Goehrs, whose title has been changed to Assistant Master Car Builder.

*Choctaw, Oklahoma & Gulf.*—The Eastern Division has been extended to cover the territory, Booneville to and including Baker's Spur, just west of South McAlester, also the Ardmore Branch. The jurisdiction of the Superintendent, R. E. Cahill, will cover this territory. S. H. Barnes, Superintendent at South McAlester, Ind. T., has resigned.

*Choctaw, Oklahoma & Texas.*—H. P. Greenough has been elected Vice-President.

*Chicago, Rock Island & Pacific.*—O. H. McCarty, heretofore Division Superintendent at Esterville, Iowa, has been appointed Division Superintendent at Cedar Rapids, Iowa, succeeding F. Walters, resigned. I. H. McEwen has been appointed Assistant Division Superintendent, with headquarters at Topeka, Kan.

H. T. Morris has been appointed Auditor of Disbursements, with headquarters at Chicago, Ill., succeeding S. C. Matthews, assigned to other duties.

*Erie.*—F. L. Blendinger, Superintendent of Telegraph, with headquarters at New York, has resigned.

*Hannibal & St. Joseph.*—W. Gray has been appointed General Freight Agent, succeeding D. O. Ives, promoted. W. C. Maxwell has been appointed Assistant General Freight Agent, with headquarters at St. Louis, Mo., succeeding Mr. Gray. (See Burlington & Missouri River in Neb.)

*Hecla Belt Line.*—G. M. Burbank, heretofore General Freight Agent, has been appointed General Manager, with headquarters at Bay City, Mich., succeeding U. R. Loranger, resigned.

*Illinois Central.*—Bernard Gilleas has been appointed Superintendent of the Omaha Division, with headquarters at Fort Dodge, Iowa, succeeding C. K. Dixon, deceased. C. B. Fletcher succeeds Mr. Gilleas as Superintendent of the Cherokee Division at Cherokee, Iowa. J. G. Lorton has been appointed Superintendent of the Tennessee Division at Fulton, Ky., succeeding G. A. Clark, resigned. A. H. Egan, Superintendent of Freight Terminals at Chicago, succeeds Mr. Lorton as Acting Superintendent of the Chicago Division, and J. J. Gaven, heretofore Trainmaster, has been appointed Acting Superintendent of the Springfield Division. (See Tennessee Central.)

*Illinois Southern.*—G. P. Paradis has been appointed Engineer of Maintenance of Way, with headquarters at Sparta, Ill., succeeding M. L. Morris, resigned.

*Lehigh & Hudson Valley.*—M. Rutherford will in addition to his duties as General Freight Agent, assume the duties of General Passenger Agent, relieving J. Sayer to this extent. The position of Assistant General Freight Agent has been abolished and H. G. Pierson, who formerly discharged these duties, has the title of Chief Clerk of the traffic department.

*Lehigh Valley.*—Eben E. Thomas was on Dec. 4 elected President and J. A. Middleton (Second Vice-President and Secretary of the Erie) Assistant to Mr. Thomas. Mr. Thomas is already Chairman of the Lehigh Valley, and it is understood that the two offices of Chairman and President will be combined. He is also Chairman of the Board of Directors of the Erie.

*Mexican Central.*—C. R. Hudson, heretofore General Freight and Passenger Agent, has been appointed Traffic Manager. This is a new position recently created. W. D. Murdock, heretofore Assistant General Passenger Agent, succeeds Mr. Hudson at Mexico.

*Mexican Great Eastern.*—J. A. Chisholm has been appointed Chief Engineer, with headquarters at the City of Mexico.

*Mexican International.*—J. Smith has been appointed Assistant to the President, with headquarters at Durango, Mex.

*Michigan Central.*—H. H. Adams has been appointed Assistant Division Superintendent, with headquarters at St. Thomas, Ont.

*Minneapolis, St. Paul & Sault Ste. Marie.*—The headquarters of W. M. Kellie, Superintendent of Terminals, has been removed from Gladstone, Mich., to Minneapolis, Minn.

*Missouri Pacific.*—C. A. Vermillion has been appointed Division Superintendent, with headquarters at Atchison, Kan., succeeding E. O. Man, resigned.

*New York, New Haven & Hartford.*—E. L. Pollock has been appointed Acting Purchasing Agent, with headquarters at New Haven, Conn., succeeding W. H. White, resigned.

*Northern Pacific.*—H. A. Lyddon has been appointed Master Mechanic, succeeding J. H. McGoff, resigned. H. M. Curry succeeds Mr. Lyddon as Master Mechanic at Staples, Minn. R. Smith, Master Mechanic at Glendive, Mont., succeeds Mr. Curry as Master Mechanic at Fargo, N. Dak., and A. W. Wheatly succeeds Mr. Smith.

W. C. Smith, heretofore Division Engineer at Livingston, Mont., has been appointed Division Engineer, with headquarters at St. Paul, Minn., succeeding F. S. Darling, resigned. J. G. Taylor has been appointed Superintendent of Terminals, with headquarters at Winnipeg. (See Canadian Pacific.)

*Pacific Coast.*—J. C. Ford, heretofore Assistant General Manager, has been elected Vice-President and General Manager. W. E. Pearce succeeds Mr. Ford at Seattle, Wash.

*Pennsylvania.*—J. B. Hutchinson has resigned as General Manager, effective Jan. 1, after which date he will be Assistant to the Second Vice-President. He has also been granted leave of absence for four months from Jan. 1.

J. R. Bowie has been appointed Foreman, with headquarters at Columbia, Pa., succeeding W. F. Kapp, Master Mechanic. The title formerly held by Mr. Kapp has been abolished. E. Sumner has been appointed Assistant Engineer of Motive Power, with headquarters at Buffalo, N. Y., succeeding J. M. James.

*St. Louis & San Francisco.*—C. W. Hillard, heretofore Second Vice-President and Treasurer of the Chicago & Eastern Illinois, has been appointed Comptroller of the St. L. & S. F., with headquarters in New York City.

*St. Louis, Memphis & Southeastern.*—W. B. Warren, heretofore Master Mechanic of the St. Louis & Gulf, has been appointed Superintendent of Machinery of the St. L., M. & S. E., with headquarters at Cape Girardeau, Mo., succeeding P. L. Raymond, resigned.

*Tennessee Central.*—G. A. Clark, heretofore Division Superintendent of the Illinois Central, has been appointed General Manager of the T. C., with headquarters at Nashville, Tenn., succeeding L. S. Miller.

*Washington County.*—Oscar J. Cherry has been appointed Auditor, with headquarters at Calais, Me., succeeding W. W. Colby, deceased.

*White Pass & Yukon Route.*—J. Francis Lee, Traffic Manager, with headquarters at Seattle, Wash., will, on Jan. 1, resign.

*Wisconsin Central.*—E. G. Clark has been appointed Second Assistant General Freight Agent, with headquarters at Milwaukee, Wis., succeeding F. J. Erfert, who has been appointed General Agent at Helena, Mont.

## RAILROAD CONSTRUCTION.

### New Incorporations, Surveys, Etc.

AMSBRY-ALLEGHENY.—Surveys are reported for a road between Amsbry on the Cresson & Coalport, and Allegheny township, a distance of about seven miles. The names of parties interested are not known.

ARKANSAS & CHOCTAW (ST. LOUIS & SAN FRANCISCO).—In reference to the report that an extension is to be built from Ardmore to Lawton, an officer writes that this is probable, but no definite decision has yet been reached. The road is now building between Hope and Ardmore, by way of Ashdown, Hugo, Durant and Madill. (Sept. 5, p. 695.)

ASHLAND & WOOSTER.—An officer writes that work is now in progress between Ashland and Savannah, Ohio, seven miles, under contract to W. E. Burk, Akron, Ohio. Surveys have also been made to New London, 10 miles beyond Savannah. H. B. Camp, Akron, Ohio, is President.

ATCHISON, TOPEKA & SANTA FE.—According to press reports, work is in progress on a spur line eight miles long to reach the Hebron coal mines in New Mexico.

ATLANTA & SAVANNAH.—Press reports state that at a meeting of the directors of this company an extension from Atlanta to the Alabama line, a distance of 60 miles, was voted.

ATLANTIC, QUEBEC & WESTERN.—Surveys are reported for a new road 130 miles long from Metapedia, on the Intercolonial, to Gaspe Basin, Que., with a view to developing extensive timber property. C. B. K. Carpenter, Gaspe, Que., may be addressed.

BALTIMORE & OHIO.—An officer writes that surveys are being made between Cumberland Valley, W. Va., and Harpers Ferry, 22 miles. F. H. Clements & Co., 32 South Broad street, Philadelphia, and Bennett & Talbott, Greensburg, Pa., have the contract for the work now being done between Cherry Run and Cumberland Valley, 10 miles, and between Patterson Creek and Pinto, W. Va., seven miles. This is exclusive of track laid during the present year.

CANADIAN PACIFIC.—Work has been done during the present year on nine branches, as follows:

Yorkton Extension, from Yorkton, northwest; 40 miles graded, 30 miles of track laid.

Pheasant Hills Branch, from Kirkella, northwest, 108 miles; 100 miles graded, 40 miles track laid.

Forrest Extension, from Forrest, westerly, 42 miles; 26 miles of track laid this year; first 16 miles completed last year.

Waskada Extension, Waskada to Lyleton; 20 miles completed.

Snowflake Extension, Snowflake to Mowbray; 10 miles completed.

Wellwood Extension, Wellwood to Brookdale; 10 miles completed.

Field Cut-Off, deviation Field to Ottertail, B. C.; seven miles completed.

Kootenay & Arrowhead Ry., Lardo to Gerrard, B. C.; 34 miles completed; last 10 miles laid this year.

West Selkirk Extension, West Selkirk to Lake Winnipeg Beach; 26 miles completed.

CASTLE VALLEY.—An officer writes that 20 miles of the new line out of Salina, Utah, have already been graded and that 20 miles more will be ready for grading early in 1903.

CENTRAL ONTARIO.—An officer writes that an extension from Bancroft to Whitney, Ont., 40 miles, is contemplated. The line is now worked from Picton to Bancroft, 116 miles. John D. Evans, Trenton, Ont., may be addressed.

CHARLESTON & MISSISSIPPI.—A charter has been granted this company to build from Scott County, Mo., to Hickman on the Mississippi, a distance of 50 miles.

CHICAGO, BURLINGTON & QUINCY.—Press reports state that a double track will be built between St. Joseph, Mo., and Omaha. The first 35 miles will be completed during the winter.

CHICAGO, ROCK ISLAND & PACIFIC.—Press reports state that contract has been let to McMurray & O'Shea, Denison, Texas, to grade an extension from Milburn, Ind. T., to the Red River. The distance direct is about 25 miles.

Surveys have been made for relocation of the line between Windsor, Mo., and Kansas City, which avoid three tunnels and give a route by way of Chilhowee, Holden, Strasburg and Pleasant Hill, making the shortest line between Kansas City and St. Louis.

CINCINNATI, DAYTON & FORT WAYNE.—This company was incorporated at Columbus on Dec. 8. The three projected termini of the road are to be Cincinnati, Fort Wayne, Ind., and a third point on the Indiana line not yet determined.

CLEVELAND, LORAIN & WHEELING (BALTIMORE & OHIO).—Press reports state that extensive improvements are to be made during 1903, which will include additional sidings, passing tracks and cut-offs; straightening the line, reduction of grades, etc.

CLOVER RUN.—An officer writes that in addition to track laid in 1902, surveys have been made between Clover Run and Phillippi, W. Va., 14 miles. Geo. M. Cote, Parsons, W. Va., is Superintendent.

COLUMBUS, EUFAULA & GULF.—An officer writes that work is now in progress between Pittsboro, Ala., and Eufaula, 21 miles, by the company's forces. Surveys have also been made for an extension to St. Andrews, Fla., 196 miles additional. W. A. Hawkins, Columbus, Ga., is President.

DENVER & RIO GRANDE.—An officer is quoted as saying that a large amount of money will be spent during the coming year in rebuilding the line south of Denver, including the 1 per cent. grade which is being established between Palmer Lake and Husted, Colo., surveys for which are now practically completed.

DENVER, NORTHWESTERN & PACIFIC.—Proposals for grading the second section must be in the office of the Utah-Colorado Construction Company by Dec. 15. The contract is for 36 miles and includes a tunnel. (Dec. 5, p. 933.)

DETROIT & MACKINAC.—It is reported that the Ann Arbor is preparing to build a connection with the Detroit & Mackinac by a new line. Engineers are reported at work between Owosso and Saginaw, Mich.

Edmonton, Yukon & Pacific (Canadian Northern).—This line, which runs four miles out of Edmonton, was opened for traffic Nov. 28.

Ellenville & Kingston (New York, Ontario & Western).—An officer writes that this new line in New York is completed and in operation to High Falls, and will be opened from Ellenville to Kingston Dec. 15. Stations and yards are not quite completed. The distance between the points named is 27½ miles.

Enid, San Diego & Pacific.—A charter was granted this company in Oklahoma, Dec. 1, to build from Enid, Okla. T., to San Diego, Cal., approximately 1,000 miles. John B. Linden, President of the Denver, Enid & Gulf, is one of the incorporators, and may be addressed at Guthrie, Okla. T.

Esquimault & Nananimo.—It is proposed to build a spur of 3½ miles long to reach a new smelter at Crofton, B. C. Work will begin in the spring.

Fort Worth & Rio Grande.—An officer writes that an extension is now building from Ceres to Brady, Texas, 30 miles, in addition to track laid during 1902. No further work, beyond this, is contemplated at present. Johnson Bros., St. Elmo, Ill., are the contractors.

Great Northern of Canada.—Surveys are reported for the proposed extension from Columbia, B. C., to the Granby, British Columbia, and Montreal mines near Greenwood, B. C. Work will probably begin within the year.

Greenwich & Johnsonville.—An officer writes that work is now in progress by the company's forces on an extension from Greenwich to Schuylerville, N. Y., 7½ miles. J. C. Blandy, Greenwich, N. Y., is President.

Hazen & Northern.—This company has been chartered by the State of Arkansas. It will build a railroad from Searcy to Heber, Ark., a distance of 53 miles. Work will begin at an early date.

International & Great Northern.—An officer writes that at present 45 miles of new road is building in Texas, between Navasota and Madisonville, in addition to track laid during 1902. Hugh Burns, Taylor, Texas, is the contractor. Surveys have also been made between Houston and Beaumont, 86 miles.

Lancaster & Chester.—An officer writes that this line, extending between the points named, in South Carolina, 29 miles, has been changed to standard gage during the year.

Little Rock & Southern.—Charter was granted this company on Nov. 30 to build a railroad from Transwood, Ark., in a southerly direction a distance of 108 miles; several minor branches will be built, aggregating a total of 203 miles. The Rock Island system is reported to be behind this new company.

Malad Valley.—Articles of incorporation of the Malad Valley Co. were filed at Salt Lake on Nov. 25. This company proposes to build a line 40 miles long from Corinne, Utah, to Malad City, Idaho. The incorporators are W. H. Bancroft, E. E. Calvin and others, all of Salt Lake.

Manchester, Dorset & Granville.—Work has been begun on this new railroad, which is to be 22 miles long. It will connect with the Delaware & Hudson at Granville, N. Y., and will open up the slate regions of Dorset, Pawlet and Rupert, Vt. (July 4, p. 544.)

Michigan Central.—An officer replies to our inquiry about projected work for the coming year, that double tracking and grade reduction will be done, but no new road will be built.

Missouri, Kansas & Texas.—Press reports state that the new line from Stevens, Ind. T., to a point three miles beyond Dewey, 27 miles, has been completed and is in operation.

Montana Roads.—It is said that the Rustler Mining & Milling Co. will build a railroad 20 miles long from their mines to Libby, Mont.

Natchez & Gulf.—The contract for building this road has been let to the New York Construction Co. A line 200 miles long is projected from Natchez to Gulfport, Miss. A. G. Campbell is President and W. W. Hungerford, of Gulfport, is Chief Engineer. (Oct. 24, p. 825.)

New Hampshire Roads (Electric).—The State Railroad Commission writes that approximately 100 miles of electric road have been built and equipped in New Hampshire during 1902.

Newton & Northwestern.—An officer writes that the extensions now building from Gowrie to Rockwell City, Iowa, 19 miles, and from Fraser to Boone, seven miles, are under contract to Henry F. Balch, of Boone, Iowa, and that surveys have also been made between Boone and Newton, Iowa, 54 miles. Hamilton Browne, Boone, Iowa, is President.

New York & Berkshire (Electric).—Press reports state that this company is planning to build an electric line from Great Barrington, Mass., to Copake, N. Y., a distance of 13½ miles, to connect with the Harlem Division of the New York Central & Hudson River.

New York & Susquehanna.—Contract for building 16 miles of railroad between Ralston and Towanda, Pa., has been let to the Crary Construction Co., of New York. The work is to be finished by July 1.

New York, Ontario & Western.—See Railroad News.

Niagara Transfer.—This company was incorporated in New York Dec. 4, to build a steam railroad from Buffalo to Tonawanda, 10 miles. John C. Conway, Wm. H. Alport and others, of Buffalo, are directors.

Orford Mountain.—An extension of about seven miles will be built from Kingsbury, Que., to Windsor Mills, according to press reports. At Windsor Mills junction will be made with the Grand Trunk. The Orford Mountain is at present in operation from the Canadian Pacific at Eastman, to Kingsbury, 27 miles.

Oregon Short Line.—An officer writes that the line now building at Terminus, Utah, under contract to the Utah Construction Co. of Ogden, 63 miles long, is 90 per cent. graded at the present time. This is exclusive of mileage built during 1902.

Osage & Ozark.—A charter was granted this company on Dec. 3 to build a railroad from Elden, Mo., to the Osage Iron Works, a distance of 25 miles. The incorporators are A. F. Brown, J. F. Cox, W. H. Glaskins and others, of Kansas City.

Ottawa, Brockville & St. Lawrence.—Surveys are now being made for a new road, 55 miles long, to run through Richmond, Merrickville & Rideau Counties to Brockville, Ont. This branch will afford direct connection with the Grand Trunk, and by means of a ferry, will also connect with the New York Central & Hudson River at Morristown on the St. Lawrence. E. J. Walsh, of Ottawa, is said to be interested.

Pennsylvania.—The directors have authorized the building of an elevated road approximately a mile long through West Philadelphia, from the yards near 34th street, to a connection with Greenwich, to facilitate the distribution of coal. The estimated cost is about $500,000.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Contract was let by the above company to S. Casparis on Dec. 2 to build a third track between Steubenville and Mingo Junction, Ohio, a distance of three miles. Contract was also let to the Columbia Construction Co. to build a second track from Boyce to Canonsburg, Ohio, a distance of about eight miles.

Porvenir & Matehuala.—An officer writes that no additions to the line have been made during the current year but surveys have been made from Azul to Dolores, Mexico, 3½ miles.

Quincy, Omaha & Kansas City.—An officer writes that no new mileage has been added during 1902, but contracts have been let to the R. J. Boyd Co., of Kansas City, for an extension three miles long from Avon to Harlem, Mo.

St. Louis & San Francisco.—It is said that work will begin at once on the Platter cut-off, which will connect the main line with a point on the Arkansas & Choctaw, a distance of 10 miles.

Salem, Falls City & Western.—An officer writes that work is in progress on an extension from Dallas to Falls City, Ore., nine miles. The work is being done by the company's forces. L. Gerlinger, Portland, Ore., is President.

Sandwich, Windsor & Amherstburg (Electric).—See Railroad News.

Smithonia & Dunlap (Ga.).—An officer writes that arrangements are now being made to build an extension about eight miles long from Five Forks, Ga., to Danielsville. Work will be begun next spring. S. C. O. Kelley, Danielsville, Ga., is President.

Southern Missouri.—An officer writes that work is in progress on the section between Ozark Summit, Mo., and Bismarck, 21 miles, in addition to the track laid during 1902. McArthur Bros., of Chicago, are the contractors. Robert Moore, St. Louis, Mo., is Chief Engineer. (Aug. 29, p. 682.)

South Haven & Eastern.—An officer writes that this company has not added to its main line during 1902, but has practically rebuilt the road, and added largely to switches and side tracks. It extends from Lawton to South Haven, Mich.

Tennessee Central.—According to most recent advices, the line from Nashville, Tenn., to Hopkinsville, Ky., 70 miles, is likely to be completed by the first of April, 1903. Nearly 40 miles of track has been laid this year, from Nashville to Lebanon, with a short branch.

Texas & Oklahoma (Missouri, Kansas & Texas).—An officer sends the following as the latest report. The route of the line, now being located, will be from Coalgate, Ind. T., to Oklahoma City, about 120 miles northwest. No grading has been done as yet, but contracts will be let in about 40 days for grading, track laying and bridges. The character of the work is difficult, with maximum grades of seven-tenths per cent. and maximum curvatures of 4 deg. There will be three steel bridges, but no important trestles, and no tunnels. Address F. N. Finney, President, or F. W. Fratt, Chief Engineer, Culbertson Building, Oklahoma City.

Toledo & Western (Electric).—At a meeting of the shareholders on Nov. 29 it was voted to build from Fayette to Alburton and Pioneer, Ohio, a distance of about 14 miles.

Toronto, Lindsay & Pembroke Ry.—This company has filed plans with the Minister of Public Works for his approval of 20 miles in addition to the eight miles already approved. The part of the line for which approval is now asked runs through the townships of Carlow and Monteagle, Ont.

Wabash.—This company is reported to have purchased 50,000 acres of valuable coal lands in West Virginia. The price paid for the new property is not given.

Westchester, Kennett & Wilmington (Electric).—Charter was granted this road on Nov. 28, to build from Brandywine Springs, Pa., through Hockessin, to Kennett square. The Vandegrift Construction Company, of Philadelphia, has the contract to build the road.

Western Maryland.—A map of the proposed right of way of the connecting link between the Western Maryland Railroad at Cherry Run, and the West Virginia Central, Cumberland & Pittsburgh, at Cumberland, a distance of 10 miles, has been filed at Berkley Springs, W. Va.

Westminster, Vancouver & Fraser Valley.—Notice is given that application will be made to incorporate this company, which proposes to build from Vancouver to a point on the Fraser River at or near New Westminster, and also from the Fraser River to Chilliwack, etc.

West Side Belt (Pittsburgh).—An officer writes that work is in progress on an extension nine miles long from Bruce to Clairton, Pa.

Worcester Consolidated Street (Electric).—This company is said to be planning to rebuild the road between Worcester and Leominster, Mass. The present route is 25 miles long, while the proposed route would only be 19 miles.

York Haven & Rowenna.—This company has been incorporated at Harrisburg, to build a line between the Pennsylvania and the Northern Central.

## GENERAL RAILROAD NEWS.

Chicago & Southeastern.—John T. Dye, attorney for the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed receiver of the Chicago & Southeastern. The Central Trust Co. of New York is trustee for the bondholders and a reorganization of the property will be made in order to establish a clear title. The Chicago & Southeastern extends from Muncie to Brazil, Ind., a distance of 127 miles. (Sept. 12, p. 716.)

Chicago, Burlington & Quincy.—Announcement is made that after Jan. 1, 1903, the Burlington & Western will be operated as part of the Chicago, Burlington & Quincy system. Building will be in charge of Robert Law, and will consist of an extension from Oskaloosa to Tracy, Iowa, distance 12 miles (June 27, p. 520). It is also reported that after Jan. 1 the Keokuk & Western line will be operated under the same management. The Keokuk & Western is about 355 miles long and runs from Keokuk to Red Oak, Iowa, and has a branch from Des Moines to Cainsville, Iowa. H. C. Nutt, of Burlington, Iowa, is Superintendent.

Cincinnati, Lebanon & Northern.—It is said that the proceeds from the mortgage made by this company on Nov. 1 will be used as follows: $200,000 to pay the 5 per cent. bonds maturing in 1916, $900,000 to pay off floating debt, and $400,000 for the purchase of real estate.

Cuba Company.—The first through train to run on this road left Santiago for Havana on Dec. 8. (Nov. 28, p. 908.)

Dry Fork.—John T. McGraw, of Grafton, W. Va., has purchased the Dry Fork Railroad, which connects the West Virginia Central & Pittsburg at Hendricks with the coal and timber district.

Gulf & Ship Island.—The report for the year ending June 30 shows exceptional prosperity and progress. On 251 miles of line worked gross earnings were $1,374,684, or $5,477 per mile, as against $1,030,849, or $4,152 per mile for the year previous, an increase of $1,324 per mile of road worked. Expenses and taxes were $940,514 as against $795,560 for the year previous, leaving net earnings of $434,170 as against $235,289, and net income of $258,858 as against $4,547 for the year previous. Provision was made early in the year for extensive improvements to the main line, including reduction of grades, ballasting of track to standard, laying of new rails, etc. Of the increase in gross earnings, $275,582 was derived from freight, and $62,455 from passengers.

Indiana, Illinois & Iowa.—Gross earnings for the year ending June 30, 1902, were $1,700,817 as against $1,416,255 last year, an increase of $284,562. The principal increase was occasioned by freight earnings which were $1,534,496 as against $1,258,352. Total expenses were $1,225,417 as against $922,061 last year, the item of conducting transportation showing an increase of $184,678, and of maintenance of way, structures and equipment, an increase of $109,263. On a total mileage owned and operated of 329, 22 miles of new rails were laid and 19 miles of new ties put in, exclusive of other betterments to the line. Mileage of loaded freight cars was 16,165,539 as against 12,404,684 during the year previous. The chief increase in freight traffic was from coal, coke, ore, etc., although increases were shown in all products carried except for the unimportant item of merchandise, which decreased slightly.

Kansas City, Watkins & Gulf.—The receivership of this company came to an end on Dec. 1. H. B. Kane was the receiver.

Monocacy Valley & Frederick.—This company is reported to have gained control of the Monocacy Valley road, and it is said it will be extended from Cotoctin Furnace to Frederick, Md., 11 miles.

New York, Ontario & Western.—The amalgamation of the Port Jervis, Monticello & New York with the above company has been completed by purchase under foreclosure proceedings. It is said the New York, Ontario & Western will build from Port Jervis to Ellenville, a distance of about 25 miles.

Northern Securities.—At a hearing before Special Examiner Ingersoll, at New York, Nov. 24, evidence was presented by the railroads to show that mergers were in progress at the time of the passage of the Sherman Bill, and that Congress intentionally omitted mention of them. Statements of rates were also presented as evidence that the merger had not resulted in an increase.

North Carolina Roads.—Owing to their inability to obtain sufficient freight cars for removing lumber, the Carolina Northern, the Southern Saw Mill, and the Atlantic Seaboard Companies have gone into the hands of a receiver. This is said to be only temporary, however.

Northern Pacific.—The Port Townsend Southern, which runs from Port Townsend to Quilcene, Wash., 26 miles, has recently passed into the hands of the Northern Pacific. I. A. Nadeau, of Seattle, is President.

Pennsylvania.—The Western Union has filed a bill of complaint, alleging its right to continue in possession of its lines on the Pennsylvania property, on the grounds that it has complied with the State laws and with the requirements of its incorporation, and that the general act of Congress of July 24, 1866, made the railroad a public highway.

Pere Marquette.—Press reports state that this railroad is now under the control of a St. Louis syndicate. The syndicate members include Thos. H. West, John F. Shepley, Nathaniel Thayer, B. P. Cheney and others. It is proposed to extend the road from St. Thomas, Ont., to Buffalo, N. Y., 120 miles.

Sandwich, Windsor & Amherstburg (Electric).—This company has made a mortgage for $600,000 to the National Trust Co., of Toronto, trustee. The proceeds will be used to pay outstanding indebtedness, and provide for the projected extension of the road to Amherstburg, Ont., and other improvements. The company amended its charter last year to cover a number of extensions.

Toledo, St. Louis & Western.—The report for the year ending June 30 shows total earnings of $2,640,880 as against $2,490,566 last year, on a new mileage worked of 451 miles. After deduction of the total expenses, net earnings were $725,447 as against $690,614 last year. Gross earnings per mile of road were $5,859. During the year westbound tonnage increased 133,912 tons, or 22.8 per cent., and empty freight car mileage decreased 210,442 miles. Exclusive of repairs and overhauling four new locomotives and 100 box cars were added to the equipment during 1902.

Utica & Mohawk Valley.—The N. Y. R. R. Commissioners granted this company authority on Dec. 5 to issue a mortgage for $1,500,000; as part of the $4,000,000 mortgage previously authorized. Information regarding the use to be made of the proceeds is not available at present.